GAS JOURNAL

LIGHT ∴ HEAT ∴ POWER

BYE-PRODUCTS.

Founded in 1849 as the "Journal of Gas Lighting."

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APRIL TO JUNE, 1928.

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WALTER KING, LTD.,

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VOL. CLXXXII. No. 3385.] WEDNESDAY, APRIL 4, 1928. [80TH YEAR.

Editorial Notes.

THE PETITION FOR A ROYAL CHARTER, AND THE NEW BY-LAWS.

ALL is now in order for the presentation of the petition for a Royal Charter for The Institution of Gas Engineers. The special meeting of the members on Monday gave a unanimous endorsement not only to the movement, but to the terms of the Petition, the Charter, and the new By-laws. Those who have been instrumental in bringing this about—the President (Mr. H. D. Madden, M.Inst.C.E.), the Council, and special mention should be made of Mr. H. C. Smith, of Tottenham, and Mr. F. C. Briggs, of Dudley—must be congratulated on the complete decision of the meeting, because it is evidence not only of approval of the steps that are being taken, but a recognition of the care which the prime movers and the Council—not excluding the Solicitor and Mr. Walter T. Dunn—have taken to ensure that the steps are right and the methods of realization are as correct in detail as human ingenuity can devise. The vote was representative not only numerically, but as an expression of the opinion in all quarters of the gas profession in Great Britain. The members had the pleasure of welcoming Mr. Henry Woodall, sen., to the meeting. He is the doyen of the gas profession, and his membership dates from the early days of the British Association of Gas Managers, and has continued for upwards of sixty years. Whatever was done in the years that have gone, Mr. Woodall, keen as to their desirability, came to commend the important changes now about to be made. Dr. Charles Carpenter was there—a leader among gas engineers—to signify by vote his view that the Council are doing the right thing. And Sir Henry Maybury came among his old colleagues, at this important stage in the history of the Institution, to promise that whatever he could do in its interests should be done. We have rarely known a meeting of any organization where momentous decisions were to be made which has passed with such splendid accord as did this one. Those present did not register their adhesion to all that it proposed without entire knowledge of what they were doing. They had individually had prior to the meeting the documents before them for examination. They had the clear exposition of the President as to the necessity for using every possible means for improving the status of the Institution and its capacity for technical work; they had the supplementary explanations from Mr. Smith and Mr. Briggs, who accentuated the salient matters and their import. Every opportunity was given to attack principle or detail; but the whole case was too positive for that, and acceptance was complete.

Assuming the granting of the Royal Charter by His Majesty the King, it will mark a new era in the annals of the Institution; and so will the amended by-laws. The former will be a well-deserved honour—an honour merited by service to the country. It will level-up the status of the Institution among other technical and scientific bodies. All too long the profession of gas engineering has been without due recognition of its place in the ranks of engineering, and in the work of the nation. This has to be corrected; and this is one means of doing it. The new by-laws are the issue of a long history. Time and again there has been advocacy of a broadening of the area from which the Institution could draw technically qualified and useful members; time and again it has been urged that admission to membership of the Institution should be placed on such a plane that there is assurance that those who are in future wishful to come in are fully qualified. In brief, the future of the Institution is to be based first on technical quality, and secondly on an enlarged territory from which to draw it, which will include the technicians in the works of our plant manufacturers who can comply with the conditions laid down. Though there has been advocacy of these things in the past, and revival again and again—for example, Mr. A. E. Broadberry's Presidential Address in 1917—that nothing was done suggests that the major view was that the time was not then opportune. But men, time, and conditions have changed. What was set aside in the past as not being pressing has become a positive necessity. The gas industry deserves, and it claims, the best technical ability that its responsible men can secure for it; the conditions in which it has to-day, and will in future have, to maintain and advance its interests demand that all serviceable technical talent shall be brought into the pool, and subscribe its part to knowledge and conference. There need not be to point them any enlargement on these matters. They are all well known. We know the inherent value of the work of the industry, we know of its widespread utility; there would be an under-exercise of duty if the maximum use were not made of the intellectual power at command to bring about the fullest development along every contributory avenue. Monday's meeting set us on the high road to enabling this to be done. High estimates have been formed as to the value that will issue. We believe the day will come when there will be proof that the estimates of the present have not been pitched too high. The new power which the proceedings confer gives an assurance of more consistent higher standards and greater scope on the technical side of the industry than it has ever had before.

In this "JOURNAL" we give a brief account of the proceedings at the special meeting; in our next issue a verbatim report of the speeches on this, for the gas industry, historic occasion will be published. The meeting alone was sufficient justification for the long distances that many members travelled to be present at it. But the day's interest was enhanced by the kindness of the Governor (Sir David Milne-Watson) and Directors of the Gas Light and Coke Company in inviting the members to visit their Staines station to inspect the 1½ million c.ft. waterless holder which the contractors (Messrs. E. Cockey & Sons) have nearly completed. Many of the more daring members ascended to the top of the shell, 177 ft. above ground-

level; some contented themselves by going to the top of the disc. Inquiries and examination into details were keen and minute. This also applies to the gas-drying plant which has been supplied by Messrs. W. C. Holmes & Co. Here we saw the washer-scrubber dispensed with, and instead a welded steel tower scrubber is used, through which a solution of calcium chloride is circulated. Gas engineers will look forward to information as to relative effectiveness. The plant has been designed to have a capacity for reducing 150,000 c.ft. of gas per hour to a dewpoint of 28° to 30° Fahr. But more as to the novel features and details in a later issue of the "Journal." It was a delightful afternoon for the visit; and gratification was general over the opportunity afforded for the enjoyable trip, and at the end of it an inspection of types of the latest contributions to the vastly increasing expanse of gas engineering and gas practices.

Tenants' Freedom on Housing Estates.

The time has arrived when the gas industry should have legislatively settled once for all whether it is right or wrong for municipal authorities, who erect houses and run electricity undertakings on the security of the rates, to deny the tenants of the former liberty of choice (the same as other people possess) in the matter of light, heat, and power agents. Ethically there is no question about this new interference with the liberty of people being wrong; legally, we know of no power which enables municipal authorities to take such a course, other than refusing permission to gas undertakings to lay mains in undedicated roads (as in the Woolwich case), unless the gas undertaking has a clause in an Act which enables it to do so by obtaining the consent of the owners "or" occupiers. The legal aspect of the matter has never been determined; but the action of which there is complaint, introducing as it does a form of interference with public freedom in a manner never contemplated by the Legislature, should certainly be raised in Parliament as a definite issue. From the numerous references to the subject that there have been in our columns, it is common knowledge in the gas industry that the practice is growing among municipal authorities owning electricity undertakings to bind the tenants of such houses to electricity patronage—much, the latter find, to their discomfort and cost—and to debar the use of gas. Before 1926, municipal electricity authorities were very incensed over the fact that gas undertakings had hiring, selling, and installation powers, and they had not; and they tried on several occasions to get the restriction removed. But having obtained, in the Act of 1926, freedom and equality in this respect, many of them are imposing restriction upon their tenants, and against their competitors and large ratepayers, the gas undertaking. They themselves must not be subject to limitation; but they have no objection to putting it upon other people. That cannot go on indefinitely.

The Central Executive Board of the National Gas Council have considered the question on more than one occasion. This shows that they regard the new invasion of private rights and restriction of trade by municipal authorities as a serious matter; and, in all probability, steps will be taken by them to ensure that tenants of municipal property shall have complete liberty of choice as to the illuminant or heating agent they may purchase. If the Council take action to remove the dual injustice, they will be assured of the complete backing and co-operation of the industry; for no one can conscientiously support autocratic methods which deprive the individual of any liberty that is not opposed to the law of the land. That Parliament do not look favourably upon this municipal innovation in creating preserves for electricity undertakings and in curtailing the freedom of the people's purchasing powers in respect of daily necessities is seen by the passing of the Newport (Mon.) clause; and when the South Metropolitan Gas Company's Bill was before a House of Commons Committee recently, the Chairman (Sir Arthur Shirley Benn) stated that the action of the Woolwich Borough Council in this respect had caused the Committee anxiety.

The various forms by which local authorities bind their tenants to patronage of the municipal undertakings are well known to our readers, as are also the widespread complaints of cost at Woolwich, Cardiff, and Liverpool. And the tenants on one large housing estate in the last-named city supply an illustration of rebellion against flueless rooms and electric heating. The houses were said to be damp, cold, and cheerless last winter; and the newspapers contained complaints of not only excessive cost, but sufferings of the people and children from cold and illness. This to gain custom for the municipal electricity undertaking! There is a strong case—humane and economic—for asking Parliament to put an end to such municipally created hardship, and definitely and finally to establish the freedom which will permit the tenants on housing estates to purchase lighting and heating agents for which they have preference, and not keep them under bondage to any one. Only on housing estates (and, of course, not all of them) is there such restriction; and no commodity other than gas has an embargo placed upon it.

Things that Matter.

There was an individuality about the address which Mr. C. Valon Bennett delivered from the Presidential Chair of the Southern Association last Wednesday. He gave us an account, modestly told, of large work accomplished in connection with the Rochester, Chatham, and Gillingham Gas Company. We heard of business development of no mean order; of temporary disaster speedily conquered; and of many "little things" that are often found to be neglected in gas-works management, but which are details that are of great importance either in the aggregate or in the long-run. Though everything was stated in the address in matter-of-fact form, as is characteristic of the President, there was full recognition by those who heard that the practical mind, directed by a due sense of responsibility of the chief, was behind all that was related in the address; and this is freely acknowledged by Chairman and Directors, staff and workmen, who each and all, the President made clear, are the co-operative elements in his work—indeed, without the administrative wisdom of his Board, and the loyalty of staff and men, his own efforts would be in vain. But every chief officer has by his own worthiness to win confidence and allegiance; and at Rochester and Gillingham there are present those conditions which do cultivate personal interest and effort, and yet the discipline which is essential in every productive and trading undertaking.

The Company have (the President wishes they had not) two manufacturing stations—one at Gillingham; the other at Rochester. Had it been possible to defer the reconstruction at Gillingham for half-a-dozen years, the whole of the manufacturing plant could have been concentrated at Rochester. But time and the tide of business development wait for no man; and circumstances forced Mr. Bennett to continue the two stations. There would have been greater economy in a single works; but what was lost through the exigencies of a few years ago had its—not full, but partial—contra in the efficiencies which the scheme of reconstruction at both stations enabled the Engineer to produce. The work that has been carried out is so extensive that the brief reference we could give to it here would be of no avail; and it is all succinctly set out in the address. To the yield of greater efficiency and economy, combined with a considerable increase in the consumption of gas, is due the happy position the Company enjoy to-day. These things are not self-productive, and they all mean close application and anxiety for the Engineer and Manager; and it is clear that Mr. Bennett must have continuously had his hands full, during his executive régime at Rochester (which dates from 1913), in bringing the manufacturing and distributing plant of the Company to its present modernized state. We have the combined effects of engineering skill, reconstruction and modernization, and business development presented in a few figures. In 1912, 573 million c.ft. of gas were made; in 1927, 968 millions—an increase of 68·9 p.ct. The gas accounted for in 1912 amounted to 522 million c.ft.; in 1927, to 905 millions—an increase of 73·37 p.ct. The capital per million c.ft. sold in 1912 was £338;

in 1927, £359—an increase, with all the reconstruction that has been done, of only 6·21 p.ct. per million. The percentages compared are notable, and eloquent of how technical progress in the gas industry has done much to provide a set-off to the higher costs of materials, labour, and structural and mechanical plant. The poise between the two may not be quite complete, but, with care in design and selection, there is merely a little difference between the two such as the President illustrates by his figures—in, of course, his own circumstances. It shows that at any rate for capital expended on works and plant per million c.ft. of gas sold, the Company's consumers have not much more to pay than they had in 1912, despite all that has been done. Of course, other items have made a difference from what would have been the necessary payment per unit of gas had there been no changes in material and labour values, and in other directions, during the past fifteen years.

A thrilling part of the address is the narrative regarding the flooding of the works on Jan. 6 last, through an unkind escapade of the Medway—a large portion of the works being flooded to a depth of no less than 5 ft. The President is justly proud of the manner in which his staff and men worked in that grave emergency—they unitedly faced it with the one thought that their duty was to defeat the flood in its menace to the gas supply; and they were the conquerors. There was no cessation of supply, though operations were compulsorily diverted into abnormal courses—even to coal having to be hoisted to the overhead hoppers in 1 cwt. sacks. Words and pictures cannot convey any adequate description of all that had to be done; one may try to visualize it, but one had to be there to realize it fully. "It will be many a long day," remarked the President, "before we shall be able to eradicate all signs of the disaster." We undertake to add that it will be many a long day, if ever, before the memories of it all will be effaced from the minds of those who participated in the event, its incidents, and anxieties. However, in the face of trouble, it is very British to stand shoulder to shoulder.

Another part of the address is also highly important. It is where Mr. Bennett deals with everyday affairs, and their relation to future progress. They may be yclept "little matters;" but mostly everything is a composition of them. It is always well to examine what are often described as minor details from the point of view of total effects rather than from that of their significance regarded in individual state. Even the infinitesimal departs from that character by multiplication. There are some things in the work of the industry which are not small and unimportant, but the neglect of which in many cases would suggest that they are. The testing of coal delivered to ascertain its quality is one of these; and numerous are the works which have no coal-testing system as part of the routine to ensure that what is delivered is what is paid for, and for the attainment of high working standards, and yet the importance of it in the success of an undertaking cannot be gainsaid. The losses incurred by paying for a measure of quality not received must, taking the industry through, be enormous; and, if ascertained, the consequences of the neglect in a single undertaking would probably amaze both the engineer and his Board or Committee. Anyway, every undertaking would find that proper testing of the coal would pay handsomely.

In regard to carbonization, there is the advice not to centre attention upon the gain of the utmost gaseous therm, but to examine the regulation of working from the point of view of the most economical commercial result. In the contributions to this, the secondary products take an important part, and coke outstandingly so. In this connection, the President says most engineers and managers are tired of hearing what must be done to provide coke of good quality and of proper size for the various purposes for which it is required. He follows this by uttering the warning (which shows the importance of the subject) that "unless the production and marketing of this class of fuel is dealt with in a manner not dreamed of a few years ago, the position will be more serious than we have ever known." The last sentence enforces the need for reiteration, and so do the President's remarks anent coal testing. We admit that reiteration is tiring to men who realize the truth, and put into practice the necessary principles in respect of production and marketing. While, however, these are carried on in the haphazard way that is the case to-day in so many places, the campaign must proceed; otherwise the whole industry is going to suffer. The idea is spreading among those who seriously think over the matter that the time has come when in the gas industry—including, if necessary, the coke-oven industry—arrangements should be made for the disposal at any rate of surplus stocks. In many places recently, the suggestion has also been revived that a Central Coke Organization or Regional Associations should be formed for not only regulating supplies and prices, but for making the uses of coke far better appreciated than they are at present. We have this submitted by Mr. Bennett. It is clear that we cannot go on much longer unless the matter is seriously taken up by one or other of our organizations, and pressed forward. As to tar, good wishes are expressed for the success of the Road Tar Association; and regarding the commodity itself, the point is made that it is only by the production of really suitable material that we can hope to meet the acute competition of other road preparations.

Slovenly works and showrooms come in for condemnation in the address, and that the fullest use should be made of both (when properly maintained) for education and propaganda purposes is urged. The economy, efficiency, safety, and comfort of keeping complete records of mains and services receive comment. The position of meters which make it difficult for consumers to read them as advised is criticized; and reference is made to an index with which experiment is being made that enables a meter to be read "with as little trouble as that of the milometer on a motor-car." The President urges, too, that "street lamps should proclaim we are not a moribund industry, and that best light is gas light." Regarding these matters we can do no more on this occasion than give them bare mention; and they do not exhaust the interest of an address which touched upon weak points that are—thank goodness not universally—to be found in our industry, and which require strengthening or eradication. If the address contributes to this end, the breadth of thought the President has put into its composition will be rewarded.

Views and Practices from Willenhall.

A VERY practical tone pervaded the Presidential Address of Mr. W. G. S. Cranmer, of Willenhall, to the Midland Association last Thursday. It shows the author, as we have always known him, to be an Engineer and Manager of independent judgment, but never dogmatic—always recognizing that conditions may with time alter to an extent to carry opinions to the diametrically opposite point. Examples of this will be found in his submissions on the subject of two-part tariffs and carbonization in vertical retorts as compared with his current practice of horizontal working. We have now to examine many matters in the light of change and relative effects; and, so doing, we see things which shatter old ideas and instal new ones, and simultaneously stimulate our activities in new directions. Hence it is that Mr. Cranmer, in stating his personal views on admittedly polemical subjects, does not bind himself to them for all time. It is only by discussion that questions are thoroughly analyzed, and the truth issues to the stage of common acceptance, or at any rate largely so. To such discussion, the President contributes.

Leading up to these and other matters, the President called attention to the troubles and effects that came upon the industry through the great war and the coal stoppages of 1921 and 1926. It was the grit and ability of our gas engineers, with a loyal backing, that pulled the industry through those periods, and gave the nation cause to be thankful to them; but somehow or other the nation successively overlooked their opportunity and obligation. There is, however, the satisfaction of duty done, and of the emergence of the industry from difficulty with the greater knowledge of inherent strength. That is a condition which is helpful and encouraging in scanning the horizon. The President speaks of the intensifi-

cation of competition. We see this not only in respect of gas, but in connection with the secondary products. But the men who pulled the industry through the troubles to which we have referred are the ones who will face the intensified competition with the same boldness, and who will reinforce the means of doing so. The fundamental means are by bringing to bear the highest possible efficiency on the work of production, distribution, and utilization, and in the last-named respect that is to be accomplished by the more intimate care of the consumers' appliances. We are sorry for those small undertakings that have had their conditions worsened by the events of the past fourteen years, and upon which conditions there is little hope of further improvement. The President points to the desirability of the absorption of such concerns by the larger undertakings, and then refers to the reverse side of the picture for the latter. The factors which he mentions have to be faced; and, as he says, "each proposition for amalgamation or absorption should be very carefully considered on its own particular merits." In this there will be general concurrence; but we submit the factors have to be considered not only by the larger undertakings, but by the smaller concerns, who must in the present make a liberal diagnosis of their position in the time to come when there will be greater availability of electricity, and competition will have to be met under their already onerous limitations.

The keener competition will not be confined to the thinly populated districts. It will extend to many gas-supply areas, for two simple reasons. The first is that a greatly developed, and continuously developing, consumption is necessary to the national scheme of electricity generation and transmission; the second is that the release of every local electricity engineer and manager from the duty of generating his own supply will enable him to devote himself solely and energetically to distribution and the expansion of business. Those facts will be incentives to the gas interests, notwithstanding the modern increasing costs of distribution. Mr. Cranmer calls attention to the fact that the trend is to lower distribution costs for electricity, and higher ones for gas. The distribution costs of electricity are a heavy part of the total; but overhead transmission is a feature of the large scheme, and overhead local distribution is growing, especially in country territory. On the other hand, gas is, by the very nature of things, committed definitely to subterranean transmission, and in circumstances which the new construction of roads and character of traffic are making more difficult, and which direct our distribution systems, where possible and when opportune, to find habitation under the footpaths. And so, apart from other considerations, including protective and stabilizing operations within the houses of consumers, we have to face a higher distribution expenditure, while cheap gas is the desideratum. But just as our gains in economies and efficiencies have enabled us in the past largely to counteract higher costs of materials, labour, and so forth, so we have faith that the gas industry is capable of accommodating itself to the new circumstances, and in them making healthy progress. There is full agreement with the President that low capital charges are contributory to a low price of gas; but we must not slavishly accept that as an unqualifiable dictum, inasmuch as capital expenditure frequently purchases valuable working economies, which justify the addition to capital charges. This is not said in disparagement of a very close watch being kept over capital expenditure, as is done at Willenhall, and which has resulted in this highly creditable position: The capital charges per therm sold are down to 0·72d.; the receipts for gas during the past year averaged 7·27d. per therm. This is excellent in a district largely composed of factories and workmen's houses, and few better class dwellings. Behind such data there is energetic management. The number of houses is rather below 5800, but the number of meters in service (excluding discount meters) is 6286—the excess of the latter figure over the former being due to the requirements of the factories. For such a small town the sale of nearly 9 million c.ft. per mile of main is good; and there is interest in the statement, "though in a portion of the district we have a considerable mining population who get free coal, 64 p.ct. of the private consumers use gas-cookers, and the number is rapidly increasing." Even in such circumstances, convenience is an effective business maker. In connection with gas-fires, what appears to us to be a novel practice is mentioned in the address: "The use of gas-fires or other heating appa- "ratus is encouraged by a liberal concession in the charge "for gas consumed; the rates charged being the same "as those used for manufacturing purposes. For arriving "at the rate to be charged, the quantity used in a factory "for manufacturing and/or heating is added to the "quantity used for heating in the private houses of any "member of the firm who may be living in the town." Is this a common practice, or only applied in the case of members of firms using gas for manufacturing purposes? The question is asked because in the "Model Clauses" the one relating to discounts or rebates for prompt payment and to large consumers provides that all discounts or rebates shall be of equal amount "under like circumstances to all consumers; provided also that notice of the fact of this enactment shall be endorsed on every demand note for gas charges." "Under like circumstances" would relate to gas-fires in all private houses.

Dealing with the subject of scientific methods of charging for gas, and particularly referring to the two-part tariff, the President is satisfied that, from an equitable point of view, the various proposals are commendable; but he is not yet convinced that it is desirable to introduce methods of charging which cannot be easily understood by the consumers. He is also of opinion that a carefully calculated sliding-scale meets the case, seeing that a consumer readily understands a system whereby he pays less per 1000 c.ft. or per therm the more he consumes. He also thinks that before any new system is adopted, there should be clear evidence that a revolution in charging methods will bring increased business. In framing our opinions regarding these matters, it is necessary to consider them in relation to the competition gas will have to meet. It is, in our view, on the two-part basis of charge that in the future electrical competition will in the main have to be met. In the first place, regarding the point as to whether or not a two-part tariff could be easily understood by the consumers, there has now been considerable experience of it in the electricity industry, and its popularity is such that hardly a week passes without fresh information reaches us of additional undertakings having determined to adopt it. We have also the experience with the telephone system; and in America those gas undertakings that have applied multi-part tariffs report satisfaction on the part of their consumers, and increasing business in consequence. If our competitors find the system good, and consumers are tempted to patronize them in consequence of its operation, then we have to do something to counteract such migration, and nothing better is available than to adopt the same method. There are notable advantages in the two-part tariff. Not only does it provide for a proportionate payment of the overhead charges by consumers, but it is a business developer, and, through the low secondary charge, it automatically decreases the price to consumers as consumption increases. Furthermore, the secondary charge, if based upon the therm (and not on the 1000 c.ft.), has the advantage of being a figure that is nearer to the charge per KW.-H. We feel that commercially this is a striking benefit, as the potential heating value given by a therm of gas and a unit of electricity in relation to cost can be readily compared. Nevertheless, there are other engineers and managers in the gas industry who think the same as Mr. Cranmer; there are large numbers who, like ourselves, look at the matter from the point of view of expediency, especially having regard to the heating avenues of development being those along which the gas industry is destined to make the greatest future progress. This, of course, all applies more to domestic consumption than to the industrial. It is quite conceivable that the President, having such a large industrial consumption, would find that a carefuly calculated sliding-scale would meet the case in that section of business.

Regarding his works, Mr. Cranmer continued the use of horizontal retorts when reconstructing his carbonizing plant; and he has no reason for regretting the decision. We congratulate him upon the fact that for the past six months his make has exceeded 73 therms per ton

of coal, making gas of 540 B.Th.U. per c.ft., which is the declared value (Willenhall is one of the few undertakings with such a figure in this country). To it, the President is by no means wedded, for he remarks: "There appears to be a general tendency in the industry "to increase the quality to the neighbourhood of 500 "B.Th.U.; and for use in burners for ordinary incan- "descent lighting, I am inclined to think that is a more "suitable figure than the higher one, and may in the "course of time be standardized." We hope not. The industry must retain the liberty which it obtained in this respect under the Gas Regulation Act; for we have little or no knowledge as to what we may come to in the future in regard to the best calorific value gas to manufacture, particularly if in time our heaviest load is for domestic heating and industrial uses. In dealing with his works, and on the subject of inspection of industrial gas appliances, the President incorporates many good points which will be found of interest to those who search experience for suggestion and guidance.

Central Coal-Selling Scheme Development.

The coal-marketing scheme of the Yorkshire, Lancashire, and Midland coalowners came into operation last Monday, before which day members of the Central Collieries Commercial Association (the Five Counties Scheme) were advised by the Quota Committee the amount of coal they will be allowed to raise during April. The levy for financing the organization, and for eventually assisting operations in regaining export business, will also come into immediate operation. The main features of the scheme as it now stands are: (1) Monthly output is to be cut by each pit to 65 p.ct. of the actual production in a month to be chosen from the years 1913 to 1927 inclusive; (2) a levy of 3d. per ton on all coal raised; (3) a fine of 3s. per ton on all production in excess of the 65 p.ct. quota.

The justification put forward on every conceivable occasion by the coalowners for what is being done is, of course, the admitted uneconomic condition of the coal industry; and for this they largely blame the coal miners, while selecting large home consumers, and especially the public utility undertakings, to carry the financial burden of their rehabilitating proceedings. The miners regard the recent closing of pits and short-time working to be due to the limitation of the amount of coal which is to be raised under the scheme, to which the owners reply that any displacement of men which may take place in the near future will be attributable not to the operation of the scheme, but to the long strike of 1926, which did so much to ruin the export trade of this country, and to stimulate production on the Continent. What our Continental competitors then gained, they naturally want to retain. Therefore it is asserted by the coalowners that the British industry cannot be restored until supply is placed in better relation to demand. The process of doing this must, of course, bring upon the reduced production an increase in the average cost of overhead charges per ton of coal. That is inevitable. But under the scheme, this will have to be borne by home consumers, who have also to finance the new organization, and provide funds for carrying on the fight with the Continental producers for business overseas.

Now that a beginning has been made, no one knows where will end the development of the organization, and its power in regulating the coal business of the country. It is noticed that Lord Aberconway, at the meeting of the Firbeck Main Collieries in Sheffield the other day, described the new selling organization as the biggest thing that had ever been done in the coal trade. He added: "I "think it is a scheme that may lead to wider develop- "ments. The idea of syndicating the output of basic "industries has made very great progress on the Con- "tinent; and although we do not rush at these things "in this country, a great deal can be said for develop- "ment in this direction." Then, again, we have the Humber coal exporters entering into an agreement to co-operate with the coalowners to make the export scheme successful; and what is referred to as a "most important matter" is that they have decided that the resale of export coal to inland markets shall be discouraged. In other words, home consumers are not to have the opportunity of buying (if any became available) coal they themselves are to be called upon to subsidize for export! In fact, standardized conditions of sale of subsidized coal have been framed; and, for the first time in the history of the coal trade, the coal exporters are to be paid a fixed remuneration on the sale of subsidized coal. Speaking at the Doncaster Coal Exchange luncheon last Wednesday, Mr. A. W. Archer, who has been very active in the formation of the Central Collieries Commercial Association, mentioned that a shipping bureau is to be established for promoting and protecting the interests of exporting coal-owners; and, to make the Humber ports more attractive, the bureau would hold out a hand of friendship to all nations. In his view the Association (which represent nearly 120 million tons of coal) is the greatest single coal-operating unit in Europe, and is likely to become the largest single factor in the European situation. The militant inclinations of the members in respect of business abroad is shown by Mr. Archer's further remarks: "We are deter- "mined to have our fair share of the European trade. If "we have to fight, we will fight. Whatever is necessary "to enable the Humber to recover a large part of its lost "exports will be done, and prices will be adjusted to meet "necessities." There is no doubt that Poland and Germany are viewing with some trepidation the new movement in this country; and they will think long and deeply over the challenge that is being made. Probably they will view more favourably the suggestion of Mr. Archer that there is a more reasonable way than a trade fight to settle the issue. Already, it is learned, discussions have taken place with the Westphalian Syndicate. There is no care as to what happens in making peace with the coal interests of Poland and Germany; but coal consumers at home are not looking cheerfully upon the prospect of being penalized to provide the funds for commercial warfare in other countries.

Sufficient has been said from the side of the coalowners to show large home buyers that they need not expect much consideration from those associated with this scheme. They are out for achieving their own ends in their own way, without reference to the customers who are their main support.

Coal Merchants and Canaries.

Canaries thrive better in rooms that are coal heated than in those that are not—indeed, "song birds contract bronchitis and asthma in impure air. So do humans." We hope our readers will take this seriously, and refrain from laughter. We are not the authority for the statements. The information is gathered from a circular which has reached us, and which has been distributed among the householders in a certain town, and possibly among those in many others. It bears the heading, "Coal Fires and Canaries." In the bottom left-hand corner is printed the imitation of a seal, bearing the words: "Coal Fires for "Health and Comfort." Also the serial indication "E.S. No. 1." The "No. 1" suggests a beginning. In the "Journal" for Feb. 22 (p. 454), reference was made to the wounded feelings of the coal merchants owing to the large and continued transfer of the affections of householders from coal to gas for cooking and heating, and to gas and coke for water heating. It was then also told how the coal merchants had resolved to institute a campaign throughout the length and breadth of the land to popularize the use of crude coal, and so attempt to continue the pollution of the atmosphere, blacken our buildings, disintegrate the surfaces of stonework, and do other diabolical things—such as impair the health of humans and even of canaries, and increase housework and the outlay for domestic labour—which scientific heating by gas eliminates. We have been watching for the inauguration of the campaign. Rumours have reached us that literature is to be sent broadcast among the people, and that posters are to adorn or disfigure the available mural spaces in our cities and towns. But those are only rumours; we cannot vouch for their accuracy. The thought occurs that this little "canary" leaflet "E.S. No. 1" may mark the commencement of

the popularizing "campaign." Whether or not it is so, it is clear that it emanates from coal merchants, and no firm's name is upon it. No blame should be attached to any firm or firms of coal merchants for not acknowledging the parentage, for the message is really comical, or worse—it is piffle of the highest order. Although we are loth to take up space in a technical paper with such rubbish, it would not be right to deny those who have not seen the circular the fun to be derived from reading it. Here it is:

Coal Fires and Canaries.

There would not appear to be any connection—neither would there between white mice and submarines. But both canaries and white mice show signs of distress in the presence of harmful gases.

Cast your thoughts back to your early days, and you will remember that it was not when the coal or wood fire was lit that the canary was covered up, or taken from the room. Ask a bird fancier why this was done; and he'll tell you that song birds contract bronchitis and asthma in impure air. So do humans.

You can tell as soon as a front door of some houses is opened what description of fire is burning.

Though funny, there is also something insidious and sinister about the statements. Gas-fires are not mentioned; but innuendo is there, at the end of the first and second paragraphs and in the third one. The gas-fire is the hated rival; and from it there are no more harmful gases in a room than from a well-behaved coal fire. If the householder has a chimney which suffers from a down draught, then no living thing could tolerate a room in which there was a coal fire burning, and into which were blowing all the filth and the gases in the products of incomplete combustion. We would suggest to the coal merchants that, if they are out for an honest campaign, not to "hit below the belt," but to have an open and fair contest. People with brains and experience of modern gas heating are not likely to be converted by such childish effort as is presented in this circular on "Coal Fires and Canaries."

Suggested Electrical Village.

In the "Electricity Supply Memoranda" this week, a review is made of the activities of the Electrical Development Association during 1927. In the course of this, it is mentioned that the Council are investigating the possibilities of organizing an Electrical Village for the Ideal Home Exhibition in 1929.

Battle of the Low-Temperature Systems.

According to information given in the House of Commons recently by Commodore H. Douglas King, Secretary for Mines, there are now five low-temperature carbonizing plants, each designed for a throughput of 100 tons a day or more, in working order in this country; and there are some six or eight further systems with experimental plants of a capacity of 10 tons a day or over. These include the type developed at the Fuel Research Station, of which a 100-ton per day plant is being erected by the Gas Light and Coke Company under the agreement entered into with the Government for a technical and commercial test. Apparently the view of the Government is that the competing low-temperature systems will not make much headway until there has been definite proof of commercial success over some years. This is evident from the remark of Commodore King that "the results obtained from these plants during the next few years should show how far, and under what conditions, each type is likely to be a commercial success."

A Monster Petrol-Tax Petition.

Among users of mechanically propelled vehicles, there is a strong feeling that a tax on petrol would be preferable to the horse-power tax. The Chancellor of the Exchequer last year had the matter investigated by Treasury officials; and he then admitted that, while petrol constituted a fairer basis of taxation, there were practical difficulties in the way of its adoption. Lieut.-Colonel Howard-Bury presented a petition in the House of Commons last week, on behalf of the Automobile Association, which had been signed by no less than 920,000 motor users and owners. The petition expressed the grave concern of the signatories at the continuance of the system of motor taxation imposed by the Finance Act of 1920. They characterized it as most inequitable and unjust to the vast majority of motor owners, chiefly owing to the levying of a lump sum on vehicles entirely regardless of the extent of road usage. They urged a flat rate of duty on petrol, *plus* a small registration fee; thus more equitably distributing the burden over all motor taxpayers. The view appears to be that 6d. a gallon on petrol would bring in a similar amount to the horse-power tax.

Industrial Co-operation.

The Joint Committee of Employers in Industry and the General Council of the Trade Union Congress which has been formed to carry out an investigation into industrial relations and organization have settled down to regular work. The programme which has been constructed from the suggestions made by the employers and the General Council of the T.U.C. may be divided into five groups. One covers all questions affecting the relations of the trade unions with employers, including recognition of the unions, victimization, collective bargaining, and works councils. The second group concerns industrial conditions—unemployment, minimum wage principles, legal regulation of hours, high wages, also participation of workers in the benefits of increased production, and publicity for the facts of industry. The third group embraces topics particularly relating to the more efficient national organization of industry. In this category are questions of management and labour, the organization, technique, and control of industry, the effects of unnecessary internal competition on the standards of labour, problems of distribution, and technical education. The fourth group embodies the financial problems affecting industry, including industrial finance, taxation, and local rates, and the bearings of the banking and credit systems and policy upon economic enterprise. The fifth group incorporates the international aspects of industry, including the competition of countries with lower labour standards than our own, the effects of international agreements and conventions, and the work of the International Economic Conference.

PERSONAL.

The Newcastle and Gateshead Gas Company have now taken over the Tynemouth Gas Company, and as a result the following appointments have been made by the Newcastle Directors: Mr. Rowland Lishman, Deputy Chairman of the Tynemouth Company, has been elected to a seat on the Newcastle Board. Mr. F. C. Willis, Engineer to the Tynemouth Company, has been appointed Assistant Engineer to the Newcastle Company; and Mr. G. J. Duncan, Works Superintendent at North Shields Gas-Works, has been appointed Manager of those works. Mr. J. J. Carr, the Secretary of the Tynemouth Company, has retired.

Mr. N. B. Thompson, Assistant Gas Manager to the Skipton Urban District Council, has been approved by the Council for appointment as Gas Engineer and General Manager, to succeed Mr. J. H. Woodward, who is retiring. Mr. Thompson (who is a son of the late Mr. J. W. Thompson, Gas Engineer and Manager to the Barnoldswick Urban District Council, whose death was recorded in last week's issue of the "Journal") has been selected from 57 applicants.

The Gold Medal of the Institution of Mining and Metallurgy has been awarded to Sir Alfred Mond, M.P., in recognition of his scientific and industrial services in the development of the mineral resources and metallurgical industries of the British Empire. The medal will be presented to Sir Alfred at the annual general meeting of the Institution at Burlington House on May 17.

Mr. J. C. Moberly, who was Chairman of the Southampton Gas Light and Coke Company, and a well-known solicitor, left estate of the gross value of £19,598, with net personalty £14,429.

In view of the retirement and death of the Rt. Hon. Viscount Cave, Sir Douglas M. Hogg, K.C., M.P., has been appointed Lord Chancellor, and the dignity of a Barony of the United Kingdom has been conferred upon him. Sir Douglas Hogg, as Attorney-General, was responsible for the piloting of the highly controversial Electricity Supply Act through Parliament in 1926, and last year the Trade Disputes Act. His services in connection with those measures were greatly appreciated by the House of Commons.

ELECTRICITY SUPPLY MEMORANDA.

Growth of "E.D.A." Activities.

THE Electrical Development Association are living up to their title by the progressive development of their own activities. The annual meeting has been held, at which the Council's report and accounts were presented. It appears that the income for the year amounted to £42,671, including £7214 brought in from 1926. As the balance carried forward is £4307, it shows that the Association spent something like £3000 more than they actually received during the year. The total income apparently includes special subscriptions for the "Wiring of British Homes Campaign," in connection with which there was unfulfilled anticipation of receiving more money from the supply undertakings. However, the membership was enlarged by the enrolment of 25 additional concerns; but the Glasgow Electricity Department and the Folkestone Electric Supply Company have resigned their membership. Not all the members are subscribing according to scale; but 17 additional ones "came up to the scratch" in 1927. The Area Committees have proved to be an important institution; having shown particular enthusiasm in the two winter campaigns, the second of which is now about to expire quietly. It is regarded as advisable that these Area Committees should be established on a permanent basis, so as to widen the scope of their activities; and this is a matter which is at present under consideration. It is noticed that an Industrial Heating Sub-Committee have been formed to investigate, with the assistance of panels in various parts of the country, the industrial heating processes in which electricity is, or can be, employed. A paper on industrial electric heating is to be prepared for presentation at the World Power Conference in September this year. A Rural and Agricultural Electrification Sub-Committee are examining into possibilities in those directions from the business-producing point of view. A Refrigerating Sub-Committee are investigating technical and commercial problems in connection with the requirements and demands for electrical refrigerating machinery. It is noted with interest that the Association are looking into the question of organizing an Electrical Village for the Ideal Home Exhibition in 1929. A considerable number of lectures were delivered during the year. Apart from the electrical salesmanship conferences, 136 public lectures were delivered in 1927 in various parts of the country. Cinematograph film displays also formed a part of the Association's methods. The propaganda literature sales effected during the year produced a revenue of £5354; and the range of publications was extended by 95 new ones. It is observed that special electrical articles in the newspapers exceeded in number those published in previous years. The growth of the Electrical Association for Women is touched upon. Acknowledgment, too, is made of the services of Mr. J. W. Beauchamp, the late Director, who retired in order to take over the general managership of the South Wales Power Company; while there is congratulation that the services of Lt.-Col. Vignoles have been secured for the office of Director of the Association. There were expressions of confidence at the annual meeting as to the continued extension and success of the work of the organization.

That "Average Price" Again.

Mr. J. B. Braithwaite, Chairman of the City of London Electric Light Company, Ltd., appears to be intensely annoyed with the morning newspapers which have been calling attention to the high charges for electricity in London—just as they uncharitably did for gas in the first quarter of 1927 when the charges were up owing to the expenditure on foreign coal during the coal stoppage. Commenting on the matter at the recent meeting of shareholders, Mr. Braithwaite made a comparison with gas prices, prefacing it with the remark that one did not hear these diatribes against gas companies. His memory must be growing extraordinarily short. He claimed that electricity companies were reducing their prices more rapidly than the gas companies. How he does this is interesting. He states that gas reached its maximum price of 5s. 10d. per 1000 c.ft. in 1920, and at the end of 1927 it had fallen to 3s. 9d., or a reduction of 35·7 p.ct. This sounds good; but his Company reached their highest price for electricity in 1921, when the "average price" was 4·37d. per unit. At the end of 1922, the average price was 2·47d. per unit, or a reduction of 43·4 p.ct. Therefore, while gas prices had been reduced by 35·7 p.ct., the price of electricity had come down by 43·4 p.ct.; and yet people stated that the electricity companies were charging exorbitant prices. The first criticism which suggests itself is that Mr. Braithwaite took the price of gas to the ordinary consumers, and not the average price to the ordinary consumers *plus* the prices charged for gas under contract and for trade purposes. In the case of electricity he took the "average price," though power consumption at low prices swamps the domestic. Moreover, the price of 3s. 9d. for gas does not apply to-day. It has been further reduced. In the Gas Light area, the price is 8·6d. per therm; in that of the South Metropolitan district, 8·75d.; in the Hornsey district 8d.; while in the Wandsworth district it is 7·6d. We are surprised that Mr. Braithwaite should have compared prices on dissimilar bases, seeing that the greater complaints refer to the prices charged for ordinary service, and not power. The average price of the whole of the Company's sales of electricity is brought down only partly by definite reductions per unit, and in large measure is due to the increasing use of power units at relatively low prices. Naturally, the greater the consumption of these low priced power units, the lower becomes the average price per unit received by the Company, or any other electricity supply undertaking, over the aggregate of output. But the question is whether even at the average price of 2·47d. consumers are not paying extravagantly when regarded from the thermal point of view—a point of view to which electricity undertakings are not by any means favourable, seeing that the potential heating value of a unit of electricity means that 29 units are required to make one therm. 2·47d. multiplied by 29, equals 5s. 11·63d. per therm. Whereas, as we have previously pointed out, in the City a therm is being supplied by the Gas Company to-day for 8·6d. The average price is misleading; and so is the comparison Mr. Braithwaite made when applied to value received for money expended.

Badly Founded Comparisons at Hornsey.

Judging from statements made at a recent meeting of the Hornsey Borough Council, the Electricity Department are a little anxious regarding the low price (for the Metropolis) of 8d. per therm as charged by their competitors, the Gas Company. It is true the electricity undertaking is making a profit, that part of it is being handed over to the relief of the rates, and that a further part is going to the consumers in the shape of reductions in the prices charged to them. With such active gas rivals, the Department are alive to the fact that they themselves must be keen, and try to give satisfaction to their consumers, particularly on the score of cost. There has not hitherto been complete satisfaction; for although it cannot be said that the charges for electrical energy in Hornsey have been high, nevertheless the consumers have found grounds for complaint regarding the expense of operation. According to a statement made by Alderman Moritz at a recent meeting of the Borough Council, the lighting consumers last Christmas were given a reduction from 5d. to 4¾d. per unit for the first 300 units. As from Easter, there is to be a further concession to 4½d.; and the worthy Alderman told his fellow-members that there may be a further reduction, although his view is that there is no advantage in reducing below 4d., "which is the figure at which electricity has gas completely beaten." We admire such fine optimism and confidence; but we should like Alderman Moritz to substantiate his statement by definite figures which could be challenged by demonstration. For example, the Gas Company are supplying at 8d. a therm, which is equal to 3s. 4d. per 1000 c.ft. of 500 B.Th.U. gas. It is quite easy with modern incandescent gas-burners to obtain an efficiency per c.ft. of 25 candles, which means that for 3s. 4d. 25,000 candle power can be obtained. For 3s. 4d. at 4d. per unit, 10 units of electricity can be purchased. Taking the average efficiency of the gas-filled lamp at 0·75 watt per candle power, the 10 units of electricity are equivalent to 13,333 candle power, when the lamps are new. Thence, it is easy to see that the same expenditure on gas in Hornsey will give a quantity of light almost double that obtained from electricity. Moreover, owing to the high intrinsic brilliancy of these gas-filled lamps, it is necessary for them to be shaded, unless the users prefer to suffer growing injury to the sight by their naked use. Such shading naturally reduces the average efficiency of 0·75 watt per candle power, and so does the blackening within the bulbs.

Two-Part Tariff to be Adopted.

An interesting feature in the recommendations of the Electricity Committee at the same meeting, as dilated upon by Alderman Moritz, is the adoption by them of a two-part tariff with the primary part a fixed KW. charge, payable quarterly in advance, with a secondary charge of ¾d. per unit consumed. In the case of geysers, water-heaters, &c., the primary charge is to be 7s. 6d. per KW. a quarter. Radiators and small accumulator charging sets are to pay a primary charge of 5s. per KW. a quarter. Ovens and other cooking arrangements, with a rating of over 600 watts, and refrigerators are to pay a primary charge of 2s. 6d. per KW. per quarter. Kettles, vacuum cleaners, washers, shaving-pots, and small detached hotplates, rated up to 600 watts, are to pay a primary charge of 2s. 6d. per quarter; but if installed in addition to any of the apparatus under any of the previous clauses, there is to be no fixed charge. A fixed charge is now made for water-heaters constantly connected to the Council's mains (the supply of energy not being measured), and this is to be reduced from £7 7s. to £5 10s. per annum in respect of 200-watt water-heaters; the charge for other sizes being reduced proportionately. Alternatively, the consumer is to be allowed to take a supply of energy to water-heaters by a meter

under the item referring to kettles, vacuum cleaners, &c. Mr. Moritz, in his comments on the two-part scheme (which has been adopted by the Council), stated that the Committee want to educate the people into using their domestic power, particularly radiators, throughout the day—naturally, because the Hornsey district is one in which there is not any considerable demand for industrial purposes. There is a wealth of meaning in another remark by the Alderman. He said "a man who uses his power in a sensible way is going to make money out of this scheme; but a man who is going to use his power like a fool is not going to do so." We do not think that any comment is required upon that statement, with this exception, that we do not think any electricity consumer can "make money" out of the scheme. What they can do by it is to save money on the old flat-rate charges, providing they use sufficient electricity; but they will do better and get a greater range of service by sticking to gas. It would seem too that, from the point of view of Alderman Moritz, a great many people use their electrical energy like fools. The electricity consumers of Hornsey who have been complaining of the cost should ascertain whether the Alderman includes them in this category.

Economics of Power Production.

There are still some electrical men who are hankering after the introduction of a coal-carbonizing system before electrical generation; but we do not think that it matters much which way the inclination of individual engineers goes in this matter, in view of the fact that generation is now under the control of the Central Electricity Board and the Electricity Commissioners; and their plans do not embody the idea. At the same time, there is interest in considering the views of electrical engineers who are favourable to the pre-carbonization of coal, seeing that it brings us, at any rate, a step nearer to a larger acceptance of the view that the coke produced by the gas industry and the coke-oven industry is not a fuel which, on national, technical, and economic grounds, should be despised by those responsible for the generation of current in this country. Coke or coke breeze is already being employed, with beneficial effects, in company with coal in a number of power stations. A paper which raises considerations in this direction was presented to the Institution of Electrical Engineers at their meeting on March 15 by Mr. W. T. Townend. From a summary of it, as published by "The Electrical Times," we see that the author's purpose was an attempt to establish the principle that the generation of electricity in this country should not be considered as an isolated factor, but rather as part of the greater cycle of conversion of the country's coal capital into useful energy. In other words, he would like to see power stations established near the pithead, so that they could either carbonize coal at low temperatures, and use the resultant fuel for steam generation, or utilize direct the thousands of tons of low-grade fuel from the mines in pulverized form, so conserving raw coal for export or other purposes. Low-grade fuel, in the first place, means high ash content, and in many cases a large amount of moisture, all of which may be regarded as inert constituents and therefore of no avail for the purpose of generating steam, which means a large reduction of the duty of the boilers. Furthermore, low-grade fuels have not a common standard; they vary considerably in their inferior quality. Apart from this, it cannot be imagined that, if these low-grade fuels could be swallowed up for generating electricity, the coal owners would be inclined to continue to part with them at the poor prices which they are willing to accept to-day—prices admittedly below what they should be, having regard to the calorific value of the fuel. Even assuming that these fuels were pre-carbonized, and the coke was pulverized, as some engineers think would be advisable, there arises the question of whether the difference in thermal efficiency between the use of coke without pulverization and the use of the same material pulverized would justify the expenditure incurred in pulverizing and handling the fuel in powdered form. The advantage is problematical.

Risks of Pre-Carbonization.

Then again, assuming pre-carbonization of any fuels at low temperature, the vacillations of the markets for bye-products would expose the electricity industry to additional financial risks; and we rather think major electrical judgment is that the industry cannot afford to speculate in this way. The safest plan is to leave carbonization systems to people who have facilities for developing them to the best advantage through the market they already possess for the primary product. Similar views to our own, we see from the discussion on the paper, are entertained by Mr. W. B. Woodhouse, Chief Engineer of the Yorkshire Electric Power Company. His opinion is that such schemes as the one the author had outlined depend to a large extent on the price of the raw material used, on the market for the bye-products, and on assured outlets for all the electrical energy produced. He commented too on the variability of the markets for secondary products, and frankly expressed the view that at the present time there is no justification, on economic and commercial grounds, for combining carbonization of coal with the generation of electricity. Moreover, he does not like the idea of making a large power station dependent upon one colliery, because of the difficulties that would be encountered in the case of labour disputes. In these opinions, Mr. Woodhouse is not alone among electrical engineers.

FORTHCOMING ENGAGEMENTS.

April 10.—National Gas Council.—Meeting of the Central Executive Committee.

April 10.—Federation of Gas Employers.—Meeting of the Central Committee.

April 12.—Midland Junior Gas Association.—Meeting.

April 13.—British Commercial Gas Association.—Conference of the South Western District at Ilfracombe.

April 14.—London and Southern District Junior Gas Association.—Visit to the tankless holder and showrooms at Woodford, and the Stratford Works of the Gas Light and Coke Company.

April 14.—Scottish Junior Gas Association (Eastern District).—Visit to the Works of Messrs. R. & A. Main, Ltd., Falkirk.

April 14.—Western Junior Gas Association.—Presidential Address of Mr. Arthur Marsden.

April 18.—Yorkshire Junior Gas Association.—Visit to the Works of Messrs. Chas. Roberts & Co., Ltd., of Horbury. Paper by Mr. W. Lofthouse on "Traffic Problems."

April 21.—Wales and Monmouthshire Junior Gas Association.—Annual meeting at Newport.

April 24.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at Tunbridge Wells.

April 25.—Manchester and District Junior Gas Association.—Visit to the Derbyshire Silica Fire Brick Company, Ltd., Friden.

April 28.—Midland Junior Gas Association.—Visit to the Apedale Pits of the Midland Coal, Coke, and Iron Company, Ltd.

May 3.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—General meeting at Tredegar (Mon.).

May 4.—North of England Gas Managers' Association.—Annual general meeting in Newcastle, 2.15. Papers by Mr. L. H. Sensicle ("Recovery Methods and the Ammonia Problem") and Mr. W. L. Robertshaw ("Notes on the Design, Maintenance, and Working of Coal and Coke Handling Plants").

May 9.—British Commercial Gas Association.—Conference of the Midlands District at Redditch.

May 16-17.—Eastern Counties Gas Managers' Association.—Meeting at Bedford.

May 17.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, W.C. 1, under the presidency of His Grace the Duke of Sutherland.

May 18.—Southern Association of Gas Engineers and Managers.—Visit to the works of the Rochester, Chatham, and Gillingham Gas Company.

May 22.—Central Committee of the Federation of Gas Employers.—Meeting at the Hotel Cecil, 10.30.

May 22.—Central Executive Board of the National Gas Council.—Meeting at Hotel Cecil, 11 o'clock.

May 22.—Federation of Gas Employers.—Annual general meeting at the Hotel Cecil, 2.15.

May 22.—National Gas Council.—Annual general meeting at the Hotel Cecil, 3 o'clock.

May 24.—British Commercial Gas Association.—Conference of the Cornish District at Truro.

The Institution of Gas Engineers.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

April 28.—Examination in Gas Engineering and Gas Supply held at centres in England, Wales, and Scotland.

May 1.—Refractory Materials Joint Committee.

May 7.—Sub-Committee of Gas Investigation Committee, to be held at Leeds University.

May 8.—Executive Committee of Gas Education Committee.

May 22.—Gas Investigation Committee in morning. Effluents Research Committee in afternoon.

June 12-15.—Annual General Meeting at Cardiff.

July 10.—Gas Education Committee.

Oct. 9.—Gas Education Committee.

Nov. 13.—Executive Committee of Gas Education Committee.

Dec. 11.—Executive Committee of Gas Education Committee.

THE INSTITUTION OF GAS ENGINEERS.

UNANIMOUS RESOLUTION AUTHORIZING APPLICATION FOR A ROYAL CHARTER.

[A Full Report will appear in the "JOURNAL" for April 11.]

Proof of the wide active interest taken in the proposed Royal Charter was to be found in the large muster of members at the Special General Meeting of The Institution of Gas Engineers which was held on Monday of this week, at the Institution of Electrical Engineers, Victoria Embankment, London, for the purpose of considering the draft of the proposed Petition, Charter, and By-Laws for submitting to His Majesty's Privy Council, as recommended by the Council of the Institution for adoption.

The President (Mr. H. D. Madden, M.Inst.C.E., Engineer and General Manager of the Cardiff Gas Light and Coke Company) was in the chair; and he was supported by Mr. James Terrace (Vice-President), Mr. C. S. Shapley (Vice-President), Mr. W. E. Price (Hon. Secretary), Mr. Henry Woodall, Senior, Sir Henry Maybury, K.C.M.G., C.B., Mr. H. C. Smith (Tottenham), Mr. F. C. Briggs (Dudley), Mr. H. H. Gracie (Edinburgh), and other members of the Council, together with the Secretary (Mr. Walter T. Dunn). There were also present Dr. Charles Carpenter and Sir Arthur Duckham, K.C.B.

Widening the Door.

In opening the proceedings, the President said that the Framing Committee had performed a great deal of careful work in the preparation of the Petition, Charter, and By-Laws. The Council felt that the time was ripe for widening the doors of the Institution, and for extending the foundations upon which it was built, so that they could include in the ranks of membership of the Institution engineers of eminence who were not actually in control of gas undertakings, but who might be of great assistance to the industry in various ways. At this time, they wanted the aid of everyone who could help them in the great cause in which they were engaged—the supply of light, heat, and power to the citizens. He expressed the great indebtedness of the Council and the Institution to Mr. H. C. Smith and Mr. F. C. Briggs, whose enthusiasm and hard work had so greatly contributed to bringing matters to their present stage.

The Resolution.

The following resolution was carried unanimously, after it had been proposed and seconded by the two gentlemen just named, and supported by Sir Henry Maybury and Mr. Henry Woodall:

> That the Council of the Institution be, and they are hereby, authorized to present to His Majesty in Council a Petition (in the form of the draft which has been submitted to this meeting, and which for the purposes of identification has been signed by Mr. Henry Dacre Madden, the President of the Institution) praying for the grant of a Royal Charter in the terms of the draft which has also been submitted to this meeting and for the purposes of identification signed by the President, or in such other terms as to His Majesty may seem proper; and that the Council be, and they are hereby, also authorized to submit for the approval of the Lords of His Majesty's Most Honourable Privy Council the proposed By-Laws of the Institution proposed to be incorporated by the said Royal Charter in the form of the draft which has been submitted to this meeting and for the purposes of identification signed by the President.

In moving the resolution, Mr. Smith said that in his opinion the amended rules could not but improve the standing of the Institution. They opened the door to those engaged in technical departments outside gas undertakings, but inside, and forming a part of, the gas industry, provided they had received a satisfactory technical training, and were able to give proof of their technical qualifications. The presence of such members at the meetings, and the technical information they would be in a position to contribute, must prove of great value to the members individually and to the Institution.

Mr. Briggs, in seconding, pointed out that, in addition to throwing open the door of the Institution to thoroughly practical men wherever employed in the gas industry, the idea was then to make membership of the Institution essentially a matter of training and examination; so that they might be sure of getting into the Institution every properly trained gas engineer, and also be sure that every member was a properly trained gas engineer. The whole thing hinged really upon a few rules.

Recognition.

Speaking as an old member of The Institution of Gas Engineers, Sir Henry Maybury said he thought that the acquisition of a Royal Charter was much overdue. He fully recognized the great work which the Institution had done.

Dr. Carpenter, too, said he had the greatest admiration for the President; and this being so, he desired to support the proposal that was before the meeting.

The Oldest Member.

The oldest member, Mr. Henry Woodall (who joined in the year 1865, when it was named the British Association of Gas Managers), gave some interesting details of early happenings. He was one of the group of engineers who were responsible for the formation of the British Association of Gas Managers, though, through a curious mischance, the details of which he related, he did not happen to be present when the Association was actually formed. Years ago, when asked what his ambition was, he replied "To be President of the Gas Managers' Association, and to make the cheapest gas in Britain." He declared, amid cheers, that he accomplished both purposes. The resolution, he believed, would result in the ennobling of a very valuable profession, and also in benefit to the country.

A Visit to Staines.

In the afternoon, members, to the number of 200, visited the Staines Station of the Gas Light and Coke Company, where they were received by Mr. J. Neath (the Engineer of the Staines

THE HISTORICAL MEETING ON APRIL 2.

[The photograph shows only a part of the large number of members present.]

Works). After an inspection of the works they were the guests of the Company at tea, which was served at the Bridge House Hotel. Here they were welcomed by Sir David Milne-Watson (the Governor), who had journeyed down from town for that special purpose.

Waterless Gasholder.

There were two specially novel features in the works. One of these was the 1½ million c.ft. waterless holder which is being constructed by Messrs. E. Cockey & Sons, of Frome. This has a diameter of 110 ft., and a height to the eaves of the roof of 177 ft. According to the Governor, about one-half of the visiting members climbed the 190 steps to the top of the holder; while, Mr. Madden added that 100 p.ct. looked in through the manhole at the bottom—the holder, by the way, having been thoughtfully lighted-up internally, so that everyone could examine the structure.

Gas Drying Plant.

The second novel feature was the gas drying plant which has been supplied by Messrs. W. C. Holmes & Co. This is situated on the outlet of the gasholders, and has been designed to have a capacity for reducing 150,000 c.ft. of gas per hour to a dew-point of 28°-30° Fahr.

KOPPERS NAPHTHALENE SCRUBBERS.

The Koppers naphthalene scrubber—in which the naphthalene is absorbed from the gas by gas oil—has already demonstrated its effectiveness and practical usefulness in eleven installations, on both coal gas and carburetted water gas, ranging in capacity from 2 million to 30 million c.ft. of gas daily.

It was explained by A. R. Powell, in a paper which he presented to the New Jersey Gas Association, that there is in the apparatus a primary or re-circulating section and a secondary or fresh oil section. In the larger plants, the secondary section is mounted on the primary section in a single tower. Gas enters the scrubber near the base, and passes, counter-current to the oil flow, first through the primary or re-circulating oil section. Next it passes through the secondary or fresh oil section, and finally through the gas outlet, near the top of the tower. The tower is provided with special packing designed to ensure intimate contact between gas and oil, and at the same time to give very little back-pressure.

Since only a small amount of oil is required, the fresh oil is injected periodically at a high rate of flow, thereby securing good distribution and consequently high scrubbing efficiency. This oil passes slowly downward through the fresh oil section; being spread out by the large surface of the special packing. The final scrubbing of the gas is effected in this section. On reaching the bottom of the fresh oil section, this oil enters the primary section, and joins the oil which is there being constantly re-circulated at a relatively high rate. The re-circulating oil drains into the pump at the base of the tower, whence it is again pumped to the top of the re-circulating section. The naphthalene in the gas is reduced by the re-circulating oil to an amount which can be entirely removed by the fresh oil in the upper section. The oil from the upper section, furthermore, continually freshens the re-circulating oil, so that the efficiency of the lower section remains practically constant. Spent oil from the bottom of the re-circulating oil sump is discarded at a regulated rate.

In the case of smaller plants, instead of the fresh oil section being superimposed on the re-circulating oil section, the two sections are side by side in a single tower having a vertical partition to separate the re-circulating compartment from the fresh oil compartment. The general operation of this type of scrubber is practically the same as that of the large single-tower apparatus. The gas flows from the top of the re-circulating oil side to the bottom of the fresh oil side, through an internal duct built along the tower partition.

Working Results.

Figures relating to the working results of two installations were quoted by the author. The first large Koppers scrubber built was installed at the plant of the Seaboard Bye-Products Coke Company, and has been successfully removing naphthalene from 25 million c.ft. of coal gas per 24 hours for a period of about two-and-a-half years. The naphthalene content of the gas is reduced to 4 grains per 100 c.ft. by the use of only 16·5 gallons of gas oil per million c.ft. If desired, the naphthalene figure can be reduced to a much lower figure than this simply by increasing the amount of fresh oil supplied.

The second example referred to was the installation of a smaller scrubber, the one at Peoria (Ill.). A characteristic of this scrubber is that it must handle mixed coal and water gas at temperatures of 90° Fahr. or higher. As the temperature of gas to be scrubbed rises, the amount of gas oil required for scrubbing rapidly increases. In other words, low gas temperatures are favourable to low oil consumption. Despite the high temperature at this plant, however, efficient scrubbing has been accomplished with only 40 gallons of gas oil per million cubic feet.

INAUGURATION OF NEW HOLDER AT LEDBURY.

The erection of a new 50,000 c.ft. spiral-guided holder at the works of the Ledbury Gas Company, carried out during the past four months, was brought to a successful conclusion on March 28, when the inaugural ceremony was held. In attendance were Mr. S. Clarke (Chairman), Mr. A. W. Owen, Mr. A. J. Chadd, Mr. A. W. Hatton (Directors), Mr. A. Blakemore (Engineer and Manager), Mr. E. Juckes (Secretary), and Mr. H. Blakeley (Director of Messrs. Firth Blakeley Sons, & Co., Ltd., of Church Fenton, the constructors of the holder).

The Chairman of the Company formally opened the holder by turning on the supply to the town.

Mr. H. Blakeley, addressing the Directors and Officers of the Company, said that the work had been completed according to contract to the satisfaction of the Manager and Engineer.

The Chairman, responding, thanked Mr. Blakeley for attending the ceremony, and expressed on his own behalf and that of his fellow Directors complete satisfaction with the way the work had been carried out.

At a later stage in the evening a commemoration dinner was held at the Feathers Hotel, Ledbury.

Mr. H. Blakeley, in proposing the toast of "The Ledbury Gas Company," said he would like, on behalf of his firm, to take the opportunity of thanking the Company for the very great courtesy and consideration shown during the progress of the contract, and also to express the opinion that in Mr. Blakemore the Company had a most capable Engineer and Manager. At all times during the contract he had found him keen and enthusiastic in his work, which showed that he had the prosperity of the Company at heart. From the records he had been able to turn up he saw that the Company reached its fiftieth anniversary last year, and that its progress had been consistently good. Whereas in 1901 the Company's consumers numbered 104 and gas appliances on hire 22, the figures had grown in 1927 to 583 consumers and over 400 gas appliances. This spoke volumes for the success and stability of the undertaking.

Mr. Clarke, responding, assured Mr. Blakeley that the Board were fully aware of the requirements of the town, and were doing the best for their consumers. He appreciated that in their present Manager they had a man fully qualified.

The toasts of the Manager and the Secretary were then cordially drunk.

Mr. Blakemore and Mr. Juckes replied.

Mr. Blakeley then asked the acceptance by the Chairman and the Directors and officials of presentation cases as small mementos of the occasion.

The health of the contractors and their representative, Mr. H. Blakeley, was cordially given.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Research on Fuels.

Consideration of the tremendous possibilities dependent upon a greater and more exact knowledge of fuels—their constitution, production, utilization, and the economics of their distribution and use—has caused the American Society of Mechanical Engineers to take definite steps toward the correlation and extension of fuel research. In October, 1927, a Special Research Committee on Fuels was appointed, and authorized to collect existing data on fuel research, co-ordinate present research efforts where possible and advisable, and carry on research on specific problems in this field.

The subjects recommended for research are:

(*a*) The constitution of coal.
(*b*) The carbonization of coal.
(*c*) The preparation of coal.
(*d*) Coal utilization and the abatement of waste in use.

As preliminary to organizing actual research work, the Committee decided to assign to each member the work of securing the desired information regarding his particular field, as included in the broad, general subjects for research determined upon. The tentative assignment of members to specific subjects is as follows:

Subject.	Member.
The constitution of coal	A. C. Fieldner
High-temperature carbonization of coal	W. H. Blauvelt
Low-temperature carbonization of coal	Dr. Walter Runge
Complete gasification of coal	W. H. Fulweiler
Other methods of processing coal	Dr. H. C. Porter
Combustion in domestic furnaces (all fuels)	J. H. McNally and F. R. Wadleigh
Combustion in central power stations (all fuels)	S. B. Flagg and W. J. Wohlenberg
Combustion in metallurgical and industrial furnaces (all fuels)	Prof. W. Trinks
Preparation of coal	J. H. McNally and F. R. Wadleigh
Petroleum products as fuel, processes and use, their economic relationships to other fuels	Prof. R. T. Haslam and Vincent G. Shinkle

After the available data have been secured, the Committee purposes to decide upon the actual research activities to be inaugurated, with plans for carrying them on and for securing the necessary personnel, funds, and facilities.

A BOOKLET FOR GASFITTERS AND ELECTRICIANS.

How Dangerous Wiring Conditions May be Averted.

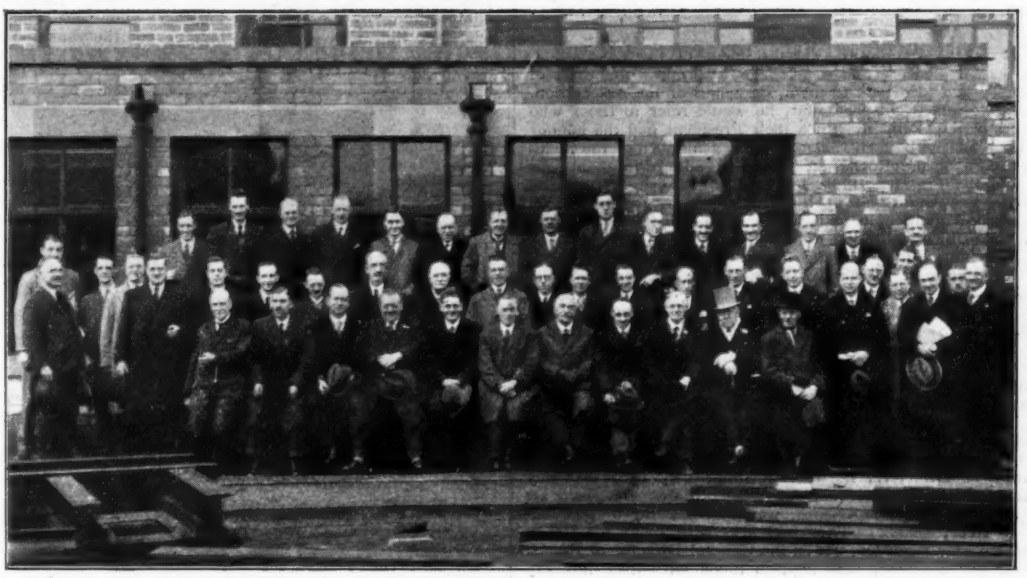
At the commencement of an excellent booklet on "The Electrical Fusion of Gas-Pipes," the author, Mr. H. C. Widlake, A.M.I.E.E., mentions how many times one reads in the Press that "the fire is believed to have been caused by an electrical short-circuit which fused an adjacent gas pipe and ignited the escaping gas." Such notices, while attributing the fault to electricity, nevertheless injure the prestige of gas; and the aim of Mr. Widlake's booklet is to enable gasfitters and electricians to identify conditions of wiring and carcassing which may lead to danger.

Mr. Widlake explains that the fusion of gas service pipes by electricity is only possible where electrical installation is of an inferior character, or has been allowed to lapse into a dangerous condition. He describes how short-circuits are set up, and makes it clear that the installation of fuses does not prevent accidents. Electricity Supply Regulations constitute no safeguard, for, though electricity supply authorities test an installation for insulation resistance before connecting to their main, they do not look for evidence of contact between the gas-pipes and conduits. The author emphasizes, too, that an installation may be all right when new, but that it soon lapses into a dangerous condition as the result of damp, rust, or corrosion—particularly in the case of a cheap job.

The author not only details the dangers, but—what is more important—also offers remedies. He states explicitly how the interests of the householder may be safeguarded; and there is not the slightest doubt that every gasfitter and electrician should have this information. It is, in fact, the duty of both gas and electricity undertakings to acquaint their employees with their obligations in this respect; and the booklet under review constitutes a most effective method of accomplishing this. We suggest its circulation among all workers in the distribution departments of gas and electricity undertakings who are concerned in the installation of pipes and wiring.

"The Electrical Fusion of Gas Pipes" is admirably illustrated, and is published by Walter King, Ltd. ("Gas Journal" Offices, 11, Bolt Court, Fleet Street, E.C. 4), at 6d. per single copy, post free. Prices for quantities (postage extra) are as follows: For twelve copies, 5s.; fifty copies, £1; 100 copies, £1 15s.; and for larger quantities there are special rates.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.



Photograph of the Members on the occasion of the visit to the Works of Messrs. W. C. Holmes & Co., Ltd., Huddersfield, on March 21. (See Report in "Journal," March 28, p 804.)

NEWCASTLE GAS COMPANY'S YEAR BOOK.

The Newcastle-upon-Tyne and Gateshead Gas Company are to be congratulated on the publication of an excellent "Year Book," which has been issued by the Directors "so that all who are interested may have correct information concerning the Company and the gas industry generally, and may realize the soundness of both." The issue of year books by public utility companies is carried out in America and Canada by the very large undertakings, but it is believed that the Newcastle Company is the first in Great Britain to do so. The book is admirably printed and illustrated, and reflects credit not only on the Company's enterprise, but also upon their good taste.

After a report of the proceedings at the annual meeting of the Company held on Feb. 28 is a short review of the undertaking's history. The first gas-works in Newcastle were established in 1817. The owners were the proprietors of a powerful local insurance association; and in January, 1818, gas lighting commenced in Mosley Street in the presence of a large crowd of spectators. The Company passed through various ownerships, amalgamations, and changes of name until 1864, when it became incorporated under its present title. In 1924 the Walker and Wallsend and the Chester-le-Street Gas Companies were absorbed, and an Order is at present before Parliament for the absorption of the Tynemouth Gas Company.

The Company is one of the largest public utility undertakings in the North of England, and has over 1000 miles of mains. Since 1910 the population in the Company's area has increased by 5½ p.ct., whereas the sale of gas has increased by 33½ p.ct. Since 1920 about 14,000 houses have been erected in the area, and over 90 p.ct. of these are supplied with gas. Of these, 80 p.ct. use gas lighting, 75 p.ct. gas cookers, 70 p.ct. gas fires, and 70 p.ct. gas wash-boilers. The convenience and ease of cooking by gas are already experienced by over 120,000 housewives in the Company's area; and in the same district 98 p.ct. of the doctors employ gas fires.

On the subject of the use of gas in industry, it is mentioned in the Year Book that specially designed apparatus is made and supplied by the Company to meet the requirements of any industry.

Facts about the Company, including a section on coke, are followed by interesting information concerning the industry generally. It is shown how amazing has been the growth of the industry, and it is indicated that there remain abundant potential markets for still greater and faster growth for both domestic and industrial purposes. One closes the book with the conviction that the Newcastle Company, in helping themselves by their splendid publicity work, are in no small measure assisting the cause of gas, and hence the health and comfort of the community, throughout the country.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL GENERAL MEETING, MARCH 28.

The Annual General Meeting of the Association was held at the Hotel Cecil, Strand, W.C., under the Presidency of Mr. C. Valon Bennett (General Manager, Engineer, and Secretary of the Rochester, Chatham, and Gillingham Gas Company), who delivered his address. There was also a lengthy discussion on Mr. Stephen Hay's paper, read at the previous meeting, on the subject of "Horizontal Settings, with special reference to Silica Retorts."

LUNCHEON.

The meeting was preceded by luncheon, at which the President occupied the chair. Those who sat with him at the top table included Alderman E. W. Willis (Chairman), Mr. E. H. Elliot (Deputy-Chairman), and Mr. Beckford Ball and Mr. R. Cobb (Directors) of the Rochester Gas Company, Mr. W. E. Dean (Vice-President of the Association), Sir Henry Maybury, Mr. F. Napier Sutton, Mr. T. Hardie, Mr. F. E. Cooper, Sir Arthur Duckham, Mr. W. A. Damon, Mr. W. T. Dunn, Mr. W. J. Smith, Mr. S. Colwell, Mr. J. C. Walker, Mr. Stephen Hay, Mr. L. Lacey, and Mr. H. C. Smith (Secretary).

The President, when the Loyal Toast had been honoured, said that, before asking the Vice-President to propose the next one, he would like to mention the receipt of a number of apologies for absence—including Sir David Milne-Watson, Mr. H. D. Madden, Dr. T. Lewis Bailey, and one of the Directors of his own Company—Major Winch.

"The Visitors."

Mr. W. E. Dean (Exmouth), Vice-President of the Association, said it was both a pleasure and a privilege to propose the toast of "The Visitors," and to extend to them, on behalf of the Association, a very hearty welcome. In particular, he would refer to those who were Directors of the Company which their President had the honour to serve. They had with them that day quite a number of the members of the Board of the Rochester, Chatham, and Gillingham Gas Company; and the President must feel highly gratified at receiving such support. The Chairman of the Company, Alderman E. W. Willis, J.P., was a gentleman with whom it must indeed be a pleasure to Mr. Valon Bennett to be associated. He was a man of many activities. Alderman Willis, he might mention, was elected a member of the Corporation of the City of Rochester as far back as 1880. He eventually became Mayor, and quite recently had been made a Freeman of the City—a signal honour, for the roll of Freeman was very limited. He was known as the "Father" of the City Council; but might he (Mr. Dean) go one step further, and call him the "Grand Old Man" of Rochester? He was the Chairman of the Water Company, and was on the Directorates of quite a number of local undertakings, and was Governor of various institutions in Rochester. Alderman Willis was (like themselves) an optimist, and saw a wonderful future for the gas industry—not only in Rochester, but throughout the country. While they had such gentlemen controlling affairs as Directors, he did not think they need fear any electrical competition. Whatever some people might imagine, his own view, after 35 years' experience, was that the day of gas had not gone. ["Hear, hear."] They had also with them Sir Henry Maybury, whom they regarded, not as the General Director of Roads, but as an old gas engineer, who kept in touch with their industry by instructing the various surveyors that they must use the tar that came from the gas-works. They also had with them another old friend in Mr. Napier Sutton, to whom gas engineers in the southern portion of England owed a great deal. Indeed, the inspectors generally were very helpful to the gas industry; and he was sure that Mr. Sutton's successor (Mr. Damon) would live up to the high standard that had been set him. There were many other visitors, whom they were all delighted to see. There were representatives of Institutions to which, he believed, as time went on they would have to contribute more funds, as they needed money, and it was only by such contributions that they could maintain their position.

An Invitation to Rochester.

Alderman Willis, in reply, said he felt it a very great honour to be present that day; and he was sure the other guests also so regarded it. They in Rochester were proud to know that the Association had selected as their President one who was so highly thought of in that city. No doubt a great many of those present had been to Rochester; and if he were to ask them what were the three most important buildings there, they would probably answer "The castle, the cathedral, and the gas-works." Each, of course, had had its own troubles. The gas-works had been invaded twice within his memory. The last time was at the beginning of this year, when the waters of the Medway suddenly decided to enlarge their boundaries and cover to a depth of 4 ft. the gas-works and the roads and land adjoining them. He went down there about 9 o'clock on the morning of Jan. 7; and a more pitiable sight he had never beheld. Both offices and works were flooded, and the Engineer, his staff, and the men were going about in boats. The appearance of their President bore not the slightest resemblance then to what it was on the present occasion. [Laughter.] It was really wonderful to reflect that, through the ingenuity and resourcefulness of the officials, and the loyalty of the men, the supply of gas to their district was not interfered with at all. Both quantity and quality were maintained to the full. Turning to the industry generally, Alderman Willis paid tribute to the work of the British Commercial Gas Association, who, he said, performed an essential service in bringing the merits of gas to the notice of the public. It was a well-accepted principle in commercial circles that those who had anything which they wanted the public to buy must advertise their commodity in every possible way. Of course, it would be no use putting gas before the public unless it was worth buying; but, as the result of their research and experiments, the industry were producing an article which the "B.C.G.A." were thoroughly justified in advertising. On behalf of his colleagues on the Board of the Rochester Gas Company and himself, he invited the members of the Association to come in great force to the city on May 18. He could promise them the heartiest of welcomes.

The President, on behalf of the Association, formally accepted the invitation to Rochester, and thanked the Chairman and Directors of the Gas Company for extending it.

"The Association."

Sir Henry Maybury, K.C.M.G., C.B., said he had the very pleasing duty of proposing the toast of "The Southern Association of Gas Engineers and Managers," and of coupling with it the name of the President. It was some years now since he last attended a luncheon or a meeting of the Association; but, through the excellent Technical Press, he had kept himself informed of their activities, and had been extremely gratified to see the success which had attended their efforts. The Association annually increased, not only in numbers, but, if he might say so, in quality as well. It was a generally accepted truism that the first love was the best, and that one always had a hankering after very early and pleasurable times. Well, he assured them that he looked back with mingled feelings of pleasure and regret upon the years—now unfortunately long past—when he was eligible for membership, and actually served a kindred District Association of Gas Engineers and Managers. There were fortunately still many among their members who were compeers of his own; but time was gradually thinning-out the ranks, and younger,

THE PRESIDENT.
C. Valon Bennett, of Rochester.

and he hoped better qualified, men were stepping into their places, with ever-increasing advantage to the great industry the Association represented. Many amongst them who now occupied positions of great responsibility he remembered almost as boys; and he thought he could apply this description quite fairly to their President, whose family had been so honourably connected with the gas industry for many generations. It was indeed gratifying to him, as an old gas engineer, to see how the industry was forging ahead, notwithstanding the intensive competition it now had to meet; and he doubted not that, with so much ability, zeal, and energy as were displayed by Associations such as their own, the increase in the production and sale of gas would continue. If the gas industry had never proved its worth to the nation before, he thought it might well be claimed, and should be recognized by the community generally, that, in the long drawn-out troubles of 1926, had it not been for the wise provision which those responsible for the gas undertakings of the country made, the health and comfort of His Majesty's subjects would not have been conserved as the industry enabled them very properly to be, by providing ample creature comforts in the form of light and heat, when the difficulties of obtaining coal, even at any price, were quite abnormal.

Importance of the Gas Industry.

Although many years ago now, in a weak moment, he deserted their ranks for a highly respectable, but poorly paid, Government appointment, he thought he could claim to know something of their difficulties and of their aspirations. It was not always recognized by those responsible for the highways of the country that the gas industry had secured parliamentary rights to the use of the highways, subject to proper safeguards and conditions, and that, in fact, with other public utility companies and undertakings, the services which the industry rendered to the body politic were not less important to the comfort and well-being of the people than was the actual use of the road by the many transport undertakings which travelled upon the surface. There had been occasions when he had heard of unfortunate misunderstandings between the officers of the gas undertaking and those of the local authority; and it had been his good

fortune more than once to be able to straighten-out these difficulties, and to see that the gas industry had "a place in the sun." Fortunately, however, such differences were very few indeed, when one remembered that there were 2000 local authorities having charge of highways in the country; and he thought it might well be a subject for congratulation that the business negotiations between the statutory undertakers and the highways authorities were conducted so happily, and with so little friction. He was indeed glad to be there that day, and to have the honour of coupling with this toast the name of the President, whom he would congratulate upon having received this signal mark of his colleagues' favour at a comparatively early period of his life. He represented, as Engineer and General Manager, a large undertaking, with considerable ability, and with gratifying financial results to his Directors and shareholders, by whom he was held, very properly, in high esteem. The position to which the members had elected him was a great compliment to the Company he represented; and it was gratifying that one bearing the names of Valon Bennett—names which carried one's memory back for more than half-a-century—was still in the forefront of the gas industry, and was sufficiently eminent in his profession to be elected President of this Association.

THE PRESIDENT'S RESPONSE.

The PRESIDENT, in reply, thanked Sir Henry Maybury in the name of the Association for the exceedingly kind way in which he had proposed this toast. It was a somewhat difficult task for him to make an adequate response; but he would be lacking in respect and failing in his duty if after merely returning thanks he resumed his seat. Sir Henry had referred in glowing terms to the Association; and they much appreciated his remarks. It was not necessary to say how much of the progress of the industry could be attributed to the work of the Association; but he did claim that its labours, and the labours of kindred Associations, were so valuable that the gas industry would be in a very different position if such organizations ceased to exist. He was only sorry they could not claim the President of the Institution of Gas Engineers (Mr. Madden) as a member of the Southern Association of Gas Engineers; but this could easily be rectified, if Mr. Madden so wished. Their immediate Past-President (Mr. Hardie) had been President of the Institution, and both the Vice-Presidents of that body were on the Southern Association roll of membership; and he ventured to say it was to the benefit of all concerned that it should be so. It had been his good fortune during the last few weeks to peruse a large number of gas companies' balance-sheets; and he had yet to find one indicating that the industry was dying. In his opinion it was never more healthy; but if it was to remain in a flourishing condition, it was not only essential that everybody concerned should keep their shoulders to the wheel and their noses to the grindstone, but there must be no place in manufacturing, distribution, or management departments where inefficient plant or methods were employed.

A SUGGESTION.

The means of manufacturing and distributing gas were so varied that it was often difficult to decide what might be best in the varying circumstances; and in this matter he ventured to make a suggestion. For many years gas engineers within the British Empire thought that only English methods were the right ones to adopt; but he was glad to think that they had somewhat recently realized that they might often learn much from their colleagues on the Continent and in America. Therefore it was their duty, not only to their undertakings and the industry in general, but to the whole community, whenever opportunity arose to visit works in other lands, to do so; and he trusted that Directors and Gas Committees would encourage their officials to inspect Continental and American gas-works, with the full knowledge that the time thus spent would be usefully employed. In conclusion, he thought he was entitled to make one further claim for the Association. It would be remembered that last year the rules were altered so as to permit the election of gentlemen, other than those engaged in direct control of gas undertakings, who, because of their knowledge and qualifications, would be of benefit to the Association. This was the first step in a matter which had had far-reaching effects; for one of the results had been that the Institution of Gas Engineers had thought fit to overhaul its qualifications for membership, and, as they were all aware, a Royal Charter was now to be applied for. The Southern Association had always been in the van of progress; and as one of its members had been the prime mover in the matter of the Royal Charter, it was only due to Mr. H. C. Smith (their Hon. Secretary) to place it upon record that he had been largely responsible, and had done much hard work, in that direction. He could assure Sir Henry Maybury that they all fully appreciated his presence, and that they, as members of this Association, intended to maintain its prestige and to continue their efforts to enhance its reputation, both within and outside the industry with which they were so proud to be connected. [Applause.]

BUSINESS MEETING.

The business meeting was subsequently held in another room—Mr. VALON BENNETT in the chair.

CONFIRMATION OF MINUTES.

On the motion of the PRESIDENT, the minutes of the last meeting, as published in the "JOURNAL," were taken as read, and confirmed.

ANNUAL REPORT.

The report for the year 1927, as circulated among the members, was next submitted. It included the following items:

The Committee have pleasure in presenting a very satisfactory report upon the work of the Association during the past year.

The membership has again increased, very valuable papers have been presented, and the discussions on them have been particularly useful from the point of view of the objects for which the Association was formed—namely, the furtherance of the technical side of the gas industry.

The Committee deeply regret to record the deaths of the following members: Mr. S. Carpenter, Bridport; Mr. A. W. Elton, Littlehampton; and Mr. D. Irving, Bristol.

The names of two members were removed from the list under Rule 3, and six members have resigned.

The total membership on Dec. 31, 1927, stood at 326.

The audited accounts for the year show a surplus of £23 1s. 1d., bringing the credit balance to be carried forward up to the sum of £113 1s. 7d.

EASTERN DISTRICT.

The period under review has been one of comparative peace in the industrial world; and the Committee are, therefore, somewhat disturbed at the fact that the monthly meetings, held in London, have not been attended by members in larger numbers. They trust, however, that wider interest will be shown during the coming session.

During 1927 there were nine monthly meetings held in London, and one county meeting, at Ramsgate. The attendance at the latter was 37, against an average of 30 at the London meetings. The value of the meeting at Ramsgate, in April, was enhanced by the opportunity, so kindly given by the Ramsgate Corporation Gas Committee, of inspecting the gas-works in that town, and particularly the installation of vertical chamber ovens. Members are also indebted to the Chairman of the Gas Committee (Councillor L. S. G. Langley) for his hospitality in providing tea for all visitors.

The discussion of commercial matters has been of particular value during the year; and it is hoped that members will in future continue freely to give any information they have which may be of assistance to others. The following is a list of papers which have been laid before members during the session; and the discussions which have followed have proved the value of such contributions: "Some Notes on Meter Indices and Index Taking," "Gasification of Coke in Vertical Retorts," "Dry Dust Extractors on C.W.G. Plants," "Vertical Chamber Ovens," "Inspection and Maintenance of Consumers' Gas Fittings and Appliances," "Retort House Control Devices," "Complete Gasification," "Gas Supply in India," "Street Lighting," "High Capacity Meters."

Many items of interest have been raised in the question box; and it is hoped that still further use may be made of this means of obtaining information and assistance.

The following District Officers were elected to serve during the coming year:

Chairman.—Mr. A. W. Sumner.

Vice-Chairman.—Mr. H. C. Smith.

Committee.—Messrs. A. H. Andrews, W. H. Bennett, D. C. Cross, T. Carmichael, H. Gage, L. G. Humphrys, S. Lacey, L. J. Langford, C. T. Price, R. H. Ruthven, C. H. Rutter, W. J. Sandeman, J. Terrace, J. S. Thorman, J. Urquhart, W. H. Warren.

Hon. Secretary.—Mr. L. Trewby.

Three members to represent the Eastern District on the General Committee, in place of those retiring by rotation.—Messrs. L. G. Humphrys, R. H. Ruthven, C. T. Price.

Representatives on the District Education Committee of the Institution of Gas Engineers.—Messrs. L. G. Humphrys, R. H. Ruthven, E. Scears, L. Trewby.

Representative on the Council of the British Road Tar Association.—Mr. L. Trewby.

The total membership of the section is 268.

C. VALON BENNETT,
Chairman.

WESTERN DISTRICT.

During the year ten meetings have been held, one each at Weston-super-Mare, Bridgwater, Torquay, and Bath, and six at Exeter. The average attendance of members at the meetings has been 16. During the year technical papers were read by Mr. C. Harris, on "Partial Drying of Town's Gas," Mr. E. P. Vince, on "Distribution and Gas Sales at Minehead," and Mr. James Taylor, on "Public Lighting by Gas." Most subjects of importance to the gas industry have been discussed, in addition to commercial matters, all of which have proved very interesting to the members attending the meetings.

The following members were elected as District Officers for the ensuing year:

Chairman.—Mr. W. E. Dean.

Vice-Chairman.—Mr. James Taylor.

Committee.—Messrs. James Armstrong, J. Hughes Cornish, C. G. Dawson, S. E. Halliwell, H. Higham, P. S. Hoyte, J. Harger Pye, H. E. Riley, C. Stapleton, A. Thomas, H. W. Versey, E. P. Vince, W. N. Westlake, J. Wesley Whimster.

Hon. Secretary.—Mr. J. B. Cattle.

J. H. CORNISH,
Chairman.

MEMBERSHIP.

Proposed by the PRESIDENT, and seconded by Mr. W. E. DEAN, the following new members and associates were elected:

Members.

Major John Eastman Blow, South Metropolitan Gas Company.

Mr. Thomas Walter Saville, Littlehampton.

Mr. Edward Cyril Shadbolt, Salcombe.

Mr. Thomas Charles Battersby, St. Albans.

Mr. John Hyde, East Grinstead.

Associates.

Mr. Charles Cooper, Messrs. W. C. Holmes & Co., Ltd., Huddersfield.

Dr. Ernest Woodhouse Smith, Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd., London.

A LOSS.

The PRESIDENT said he was sorry to have to tell them that, since the last meeting, the Reaper had been at work among

them, and had removed from their midst Mr. A. W. Elton, of Littlehampton. He would ask the members to rise in their places as a mark of respect to the deceased.

Representative on the Institution Council.

Mr. T. Hardie moved that the President be elected the representative of the Association on the Council of the Institution of Gas Engineers for the current year.

This was seconded by Mr. J. Urquhart (Dorking), and agreed to.

Presentation to the Retiring President.

The President said he felt that it was a great honour to ask Mr. Hardie to accept from the Association a silver salver, to commemorate his having acted as their President. No mere words of his could possibly express their esteem of Mr. Hardie as a man, their acknowledgment of his abilities as an engineer, and their thanks to him for having given to the Association so much of his valuable time, as well as the benefit of his vast experience. Presidents came and Presidents went, but the work of the Association went on for ever; and they were the richer for Mr. Hardie having presided over their deliberations. They trusted that he might be spared for many years, not only to carry on the great work upon which he was daily engaged, but also to assist them both as an Association and as individuals. They tendered him their sincere thanks, and hoped that whenever he saw fit to use their small gift, he might recall happy memories of his year of office. [Applause.]

Mr. Hardie said it was very good indeed of the members to receive in the kind manner they had done the much too flattering remarks of the President. While he deeply appreciated the gift of such a handsome salver, it did not need any souvenir to remind him of the exceedingly happy twelve months he had spent as President of the Association. This beautifully designed salver, however, when it was used, would be bound to draw special attention to itself; and he felt that, on such occasions, inquiries as to how he had obtained it would bring back to his memory, even if it had passed from his thoughts for the time being, the honour which the members of the Association did him when they selected him as their President. If they would allow him to take this opportunity, he would like to thank them all very much for the support they gave him last year, and especially he wished to thank the Hon. Secretary for all the assistance he had rendered. He was also indebted to those who had taken an active part in the proceedings, and to the Chairman and Directors of the Torquay Gas Company, who had entertained them so hospitably on the occasion of their visit. Further, he desired to thank his own Governor (Sir David Milne-Watson) and the Directors of the Gas Light and Coke Company for the kind and generous way in which they had helped him to do what he could to make the meetings last year interesting to the members.

Presidential Address.

Mr. Valon Bennett then delivered his address, which will be found elsewhere in this issue; and at its conclusion,

Mr. J. M. Campbell (Margate) said that, as a near neighbour of the President, and as one who had known him practically from boyhood, he had great pleasure in proposing a hearty vote of thanks to him for his address. They much appreciated all that he had said. It was quite wrong of the President to say that the address was not an inspiring one. ["Hear, hear."] The reference to the unfortunate conditions that existed at the beginning of January must have created within them all a feeling of sympathy, and a desire to congratulate him upon the way in which he overcame his difficulties. When they visited Rochester, they would, it was evident, see much that they would wish to emulate. Mr. Valon Bennett had said there was nothing novel in his works; but there were no works to which any of them could go in which there was not something they could pick up. [Laughter.] The address constituted a splendid record of work boldly executed and carefully carried out.

Mr. A. Caddick, in seconding, described the address as a record of hard and successful work in face of exceptional difficulties. The President had touched on many points which were vital to the progress of any gas undertaking; and, in spite of his great modesty, they would attach much weight to all that he had said.

The President briefly acknowledged the vote, which was accorded by acclamation.

Horizontal Retort Settings, with Special Reference to Silica Retorts.

The remainder of the time of the meeting was occupied with a full discussion (opened by Sir Arthur Duckham, K.C.B.) of the paper entitled "Some Notes on Horizontal Retort Settings, with Special Reference to Silica Retorts," which Mr. Stephen Hay read at the November meeting.

Mr. Hay, Mr. Edwards, and the Gas Light and Coke Company were heartily thanked, on the proposition of Mr. F. Livesey (Maidstone), seconded by Mr. A. Caddick, for the presentation of so much valuable information.

Mr. Livesey remarked that he owed to the authors the benefit—he hoped it would prove a benefit—of a reduction of at least 2 therms per ton. He discovered that he had been working at excessive temperatures.

The report of this discussion is held over until next week.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL GENERAL MEETING, MARCH 29.

The Annual General Meeting of the Association was held in the Grand Hotel, Birmingham; the chair at the outset of the proceedings being occupied by Mr. Francis C. Briggs, Assoc.M.Inst.C.E., of Dudley, who subsequently gave place to the new President, Mr. W. G. S. Cranmer, of Willenhall.

The Hon. Secretary (Mr. T. Thornton, of Rowley Regis) read the minutes of the last meeting, which were confirmed; and he also intimated the receipt of a number of apologies for absence.

Loss by Death.

Mr. Briggs said it was rather a peculiar coincidence that at this meeting they were to have a paper by the Engineer of the Oldbury Gas-Works, and at the same time they had to mourn the loss by death of the first Engineer of the same works—Mr. F. J. North—who had passed away since their last meeting. He was long a member of the Association, and served the industry excellently for many years in various capacities. As an administrator, he was on the Boards of several companies; and he also had experience with manufacturers. His unassuming disposition endeared him to everyone who met him; and he was a man of fastidious honour. His loss would be felt by many of them. As a mark of respect to his memory, he asked the members to rise in their places.

Past-Presidents' Medals.

Mr. Briggs remarked that the Past-Presidents' medals which could not be presented on the occasion of the jubilee dinner, owing to the absence of the recipients, had been duly forwarded and warmly acknowledged. Mr. Carder, who was in Brazil, had written congratulating the Association upon having obtained a very fine specimen of the medal engraver's art.

Report and Accounts.—The Institution Benevolent Fund.

Mr. Briggs then proceeded to move the adoption of the report and accounts. In connection with the accounts, he pointed out, there was revealed a drop in the balance of something over £11; but this was a matter for which there was no need to apologize, for on the other side there were special items totalling £32, without which they would have shown an improved balance of some £21. From the Emergency Fund there had been a contribution of £10 10s. to the Benevolent Fund of The Institution of Gas Engineers.

The report and accounts were unanimously adopted; and it was resolved that the Association should again subscribe £10 10s. to the Institution Benevolent Fund—the amount to come on this occasion, not from the Emergency Fund, but from the ordinary funds of the Association.

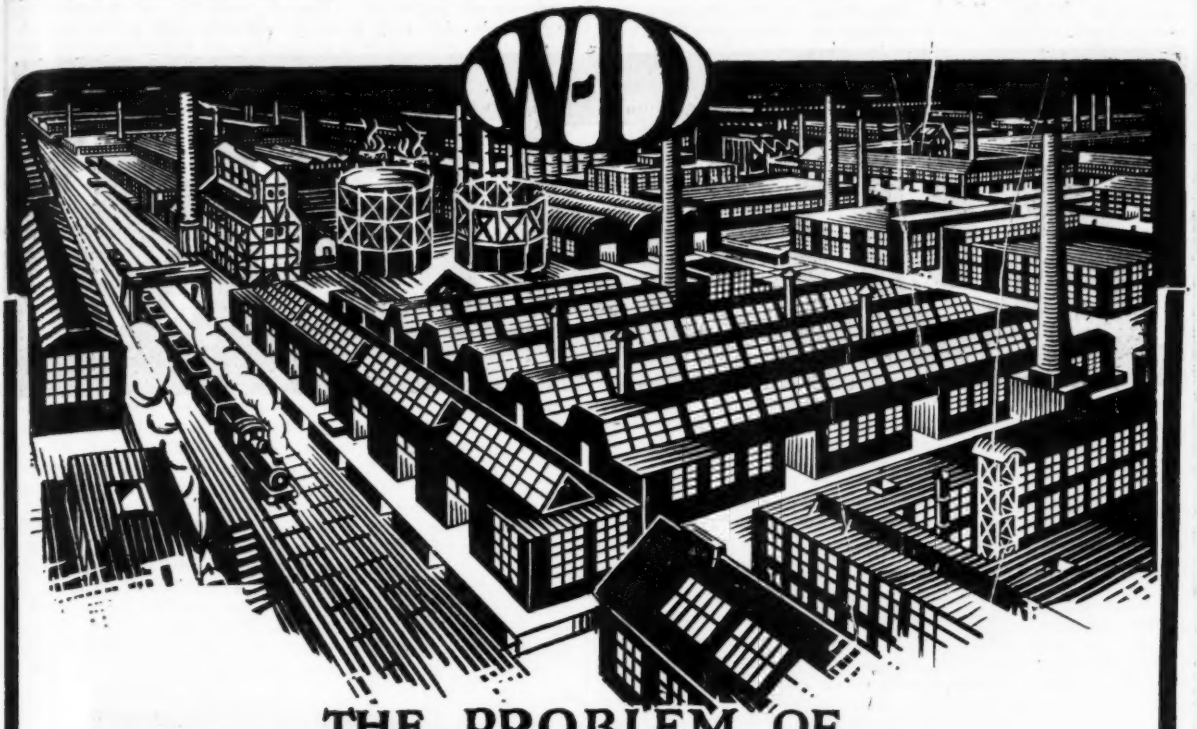
Representative on Institution Council.

On the proposition of Mr. C. M. D. Belton (Shrewsbury), Mr. Cranmer was appointed as the representative of the Association on the Council of The Institution of Gas Engineers.

District Education Committee.

It was also resolved that Messrs. Cranmer, Belton, Briggs, and Rendle be appointed to represent the Association on the Midland District Education Committee.

Mr. Briggs remarked that, though the Committee had done useful work, he thought they would have to do a good deal more work in quite a different manner. All they had power to do was to make recommendations to headquarters, and headquarters made the decisions. This might make for uniformity; but the scheme was originally devised to de-centralize the work, and so far as he could see this had not been accomplished. The whole arrangement did seem to him to be extremely cumbersome and complicated. The Education Scheme must be revised to fall in with the proposed Royal Charter; and when the time came for this revision, it should be placed on a much more businesslike footing. The "Green Book" was so complicated, and there were so many exemptions, that it was practically impossible for any student who read it to know exactly



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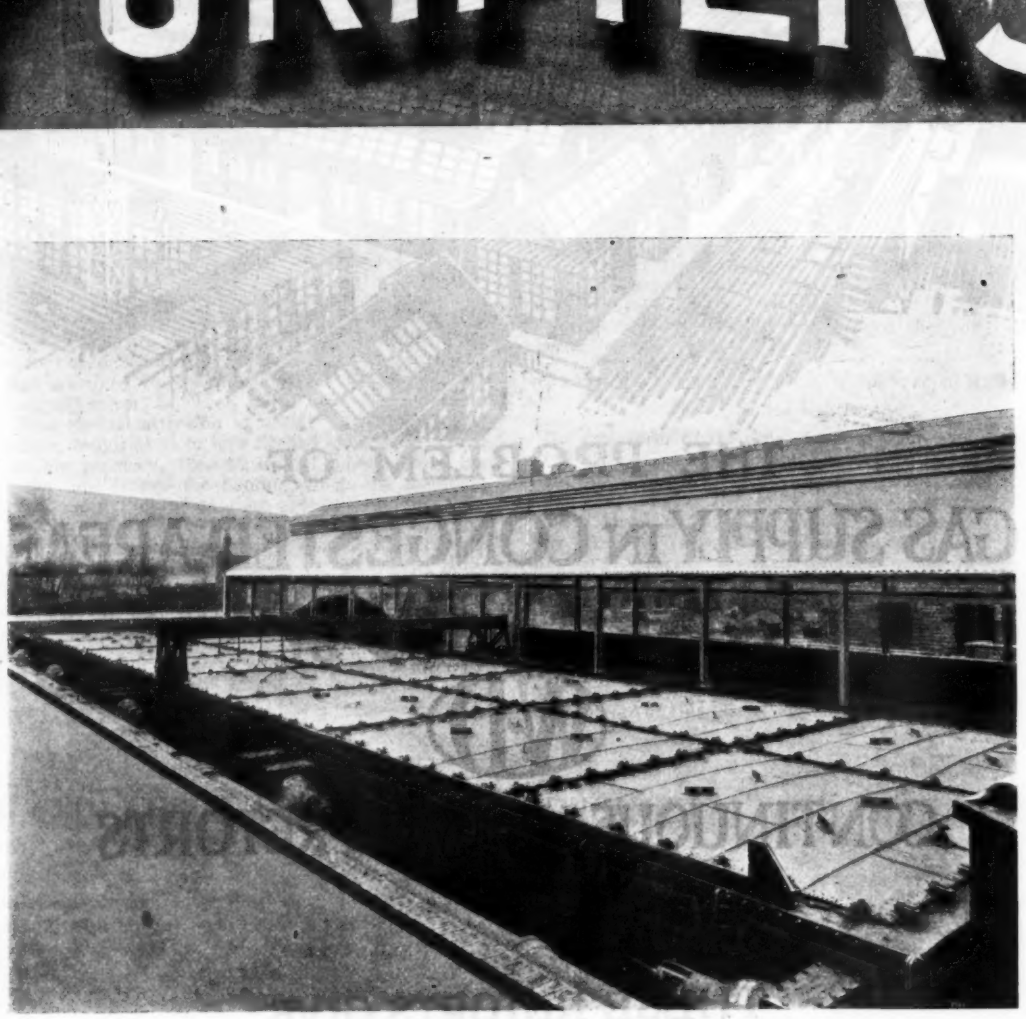

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what he had to do. ["Hear, hear."] He urged the members to do everything they possibly could so that this opportunity might be taken to put the scheme on a thoroughly satisfactory footing.

Mr. R. S. Ramsden (Leamington), proposing the appointment of the gentlemen named, asked them to do all they possibly could to ease the path of the would-be student who lived some distance from one of the approved technical colleges.

The New President.

Mr. Briggs said the Association were now paying a debt which they had owed for some considerable time. It was exactly thirty years since Mr. Cranmer was elected a member of the Association, in the interests of which he had been a hard worker—for some eight years as Hon. Secretary. He had been a lecturer—one of the pioneers of the Education Scheme which was now so dear to the hearts of all of them. Further, he sold the cheapest gas in the Black Country. With a minimum amount of expenditure, he had brought his works up to date. He had been elected on his local Council, of which there was a chance of his being in a short time Chairman. Now they had elected him President of the Midland Association.

Mr. W. G. S. Cranmer (Willenhall) then took the chair, and proposed a vote of thanks to Mr. Briggs for all he had done as President during the last two years. Probably, had it not been for the coal stoppage in 1926, Mr. Briggs would have preferred to retire from office after one year; but he remained at the head to steer them through a difficult time, and had made an excellent President. ["Hear, hear."]

Mr. Hubert Pooley (Leicester) seconded; remarking that Mr. Briggs had laboured exceedingly hard for the Association. His work in connection with the Education Scheme had been heavy, and most valuable; and his general conduct in the chair had enhanced his reputation enormously.

THE PRESIDENT,
W. G. S. Cranmer, of Willenhall.

The vote was carried by acclamation; and thereafter the President handed the Past-President's medal to Mr. Briggs, who returned thanks—saying that the past two years had certainly been a period of arduous work, but nevertheless it was with a feeling of sorrow that one stepped-down from an office in which one was able to serve in some way one's fellows.

Report of Midland Commercial Gas Association.

Mr. P. N. Langford (Coventry) next presented the report of the Commercial Association, in the unfortunate absence through indisposition of Mr. W. E. Caton, of Oxford, who had occupied the chair during the year. The Commercial Association had, Mr. Langford said, done exceedingly good work. There had during the year been nine general meetings, with a fair average attendance. Matters of interest in connection with coal, coke, and other materials incidental to their business, were fully discussed.

Support the British Road Tar Association.

There was one thing he desired particularly to mention. The British Road Tar Association which had been recently constituted was now getting well into its stride, and doing excellent work in promoting the greater use of British tar on British roads. He happened to be a member of the Managing Council of the British Road Tar Association; and he could assure them that it had already accomplished a great deal in the direction of propaganda and what was to his mind still more important work—namely, endeavouring to find ways and means of making a better road tar than had been obtainable in the past. The work of the Road Tar Association he commended to members present, as he felt that each one individually could do a great deal of good in his own area by bringing to the notice of surveyors and others the work that the Association were doing. The expenses of the Commercial Association were just about covered by the subscriptions received. They started the year with a balance in hand of £115 16s. 2d., and finished up with £115 10s. 7d., which he thought could be regarded as satisfactory. In conclusion, he urged members to attend the Commercial Association meetings in greater numbers. He said he would like to see during the present year some of the difficulties common to all of them smoothed out. In saying this, he had in mind more particularly the coke problem. By their discussions during the past twelve months a great deal had been done to promote the manufacture of coke of a size, and so forth, which would be helpful to them in the future.

The report was unanimously adopted.

Presidential Address.

Mr. Cranmer then delivered his address, which is reproduced in another part of this issue. Subsequently,

Mr. Briggs, proposing a vote of thanks to the President, said it had been a particularly interesting address—revealing, as it did, the inner life of a medium-sized gas undertaking. After all, the ultimate measure of their success was the price at which they were able to supply gas to the consumer; and judged by this standard, they must agree that Mr. Cranmer had been particularly successful in the running of his own undertaking. ["Hear, hear."] The President had told them that in a circular issued when the Willenhall Gas Company was first formed, the Directors said: "It is well known that the light of a candle, which is so brilliant when first snuffed, is very soon reduced to one-half. This is not the case with gas-lights, for as soon as the gas is allowed to issue from the burner, and a light being applied, it will immediately inflame, and will continue to burn with superior brilliancy, steadiness, and safety until the supply is discontinued." Well, one knew of gas to-day which "inflamed," but it was the consumer that it inflamed—sometimes by reason of its quality, and at others because of its price. In Mr. Cranmer's case, this did not happen. An important point mentioned by the President was that his Company designed and erected for their industrial consumers furnaces that would give them the best results having regard to their particular requirements. This was somewhat distinctive. It showed that at Willenhall the interests of the consumers were studied above everything; and they were greatly to be congratulated upon having such good service. It was the hope of all the members that the President might have a highly successful year.

Mr. C. H. Webb (Stourbridge), in seconding the vote, said he agreed entirely with the President, when, referring to the coal strike, he expressed the opinion that at such times "the whole of the increased cost of production should be at once passed on to the gas and coke consumers." The memory of the public was proverbially short—a failing by which they had all, at one time or another, suffered. He had also been interested in the President's method of combating the low-quality burners sold by certain dealers. Mr. Cranmer said: "They are usually bought by the poorest consumers; and to counteract this we offer all prepayment meter consumers a good-quality incandescent burner, fixed at cost price, taking payment by retaining the necessary amount from the discount or rebate to which they are entitled, in lieu of altering the price-changing device of the meters. This arrangement has given great satisfaction to the consumers concerned." It seemed to him to be a very smart idea.

Mr. Briggs added that there was one statement in the address which was rather gratifying. Some of them were suffering from troubles which they thought were quite modern; but, according to Mr. Cranmer, certain of these troubles at any rate existed many years ago. There was a time long ago, it seemed, when a gentleman went round stirring-up trouble in the gas industry for his own personal advantage. He (the speaker) had thought this was a modern phase; but apparently it was a very old one. [Laughter.]

Spring Meeting.

The President acknowledged the vote, and then went on to refer to the spring meeting. He said that his Board extended a cordial invitation to the Association to visit Willenhall on that occasion. There was only one date available, which was May 24; and so they had had to fix definitely upon this.

Mr. F. W. Pinson (the Chairman of the Willenhall Gas Company) said he wished to support what the President had said. He hoped as many as possible would come to Willenhall, where the Board would make them heartily welcome, and would show them what they regarded as a very good gas undertaking indeed. [Applause.]

Continuous Vertical Retort Practice at Oldbury.

Mr. Joseph Poulson, F.C.S., of Oldbury, then read a paper on the above subject which, together with a report of the discussion, is published elsewhere in this issue of the "Journal."

He was heartily thanked, on the proposition of Mr. Briggs.

The Late Mr. Robertson.

The President said they had learned with regret of the death of Mr. Peter Robertson, the Editor of the "Gas World," who was probably known to many of those present, as at one time he was a regular attendant at the meetings of the Association. His work had been of inestimable value to the gas industry; and they were extremely sorry to lose him. He asked the members, as a mark of respect, to rise silently in their places.

MR. C. VALON BENNETT'S PRESIDENTIAL ADDRESS.

Southern Association of Gas Engineers and Managers, March 28.

Gentlemen,—My first duty is to thank you again for having elected me your President; and I do so most sincerely, because I realize it is the highest honour which you have within your power to bestow. When I recall the names of those distinguished gentlemen who have occupied this chair, I am almost overwhelmed by the knowledge that I must maintain the high traditions which have been set up; and I can assure you I fully appreciate this result can only be attained by the sympathetic co-operation not only of the Committee and the officers of the Association, but of every individual member. With this assistance, I trust when my term of office expires I may hand over the position to my successor with its lustre undimmed.

Let me at the outset say the preparation of a Presidential Address appears, until one has essayed it, to be a comparatively simple task; but in my case it is made the more difficult when I reflect upon the highly intellectual and instructive address delivered last year by Mr. Thomas Hardie. I am afraid my effort may be feeble compared with his, but I am comforted by the knowledge that variety is essential in almost every phase of life. Although I have not the honour to control so huge an undertaking as the Immediate Past-President, with such a wealth of information and experience as he has at his command, I trust you will not feel I have wasted your time by asking you to bear with me for a few moments to-day.

Early History at Rochester.

I understand the invitation given by my Chairman this afternoon, that the Association should visit Rochester at a suitable date, will enable members to see our works and district for the first time; and therefore a few details connected with the undertaking which I have the privilege of serving may be of interest. But at the outset I should like to say that there is nothing particularly novel to be found in connection with our works. They have been erected with the idea of endeavouring to manufacture and supply under such conditions as will provide gas upon advantageous terms to our consumers, and at the same time ensure a reasonable return upon the capital invested by stockholders. The interests of our workpeople are equally in the minds of the Directors; but more as to this later.

Formed in 1818, it will be seen that the undertaking (then known as the Rochester and Chatham Gas Light Company) has been in existence one hundred and ten years, and may, therefore, be considered as one of the oldest concerns whose duty it has been to serve the public with gas. The name of Livesey stands so high in the esteem of the industry that I am particularly happy to state that the late Thomas Livesey, then of Wood Street, Cheapside, was one of the original shareholders.

Until the year 1854, the town of Gillingham was supplied with gas by a separate Company; but in that year the two concerns amalgamated, and under the present title the Rochester, Chatham, and Gillingham Gas Company now supplies those three towns, in addition to Strood, Rainham, and Higham. Altogether the area of supply is forty-six square miles, with a population of approximately 150,000, the miles of main being 143.

We still have two manufacturing stations, one at Rochester and the other at Gillingham, both of them being situated on the River Medway, thus enabling us to receive and dispatch raw materials and residual products by water. The lack of railway facilities has at times proved rather serious; but it is hoped that this state of affairs may be remedied at some not far-distant date.

Gillingham Station.

When I was appointed to my present post in September, 1913, it was clearly evident to me that extensive alterations to manufacturing, storage, and distribution plant were not only essential, but urgent if the Company intended to carry out the obligations which had been entrusted to it. My mind naturally turned towards concentrating the whole of the manufacture at one works, and that the Rochester Station. To my great disappointment, and for reasons into which I need not

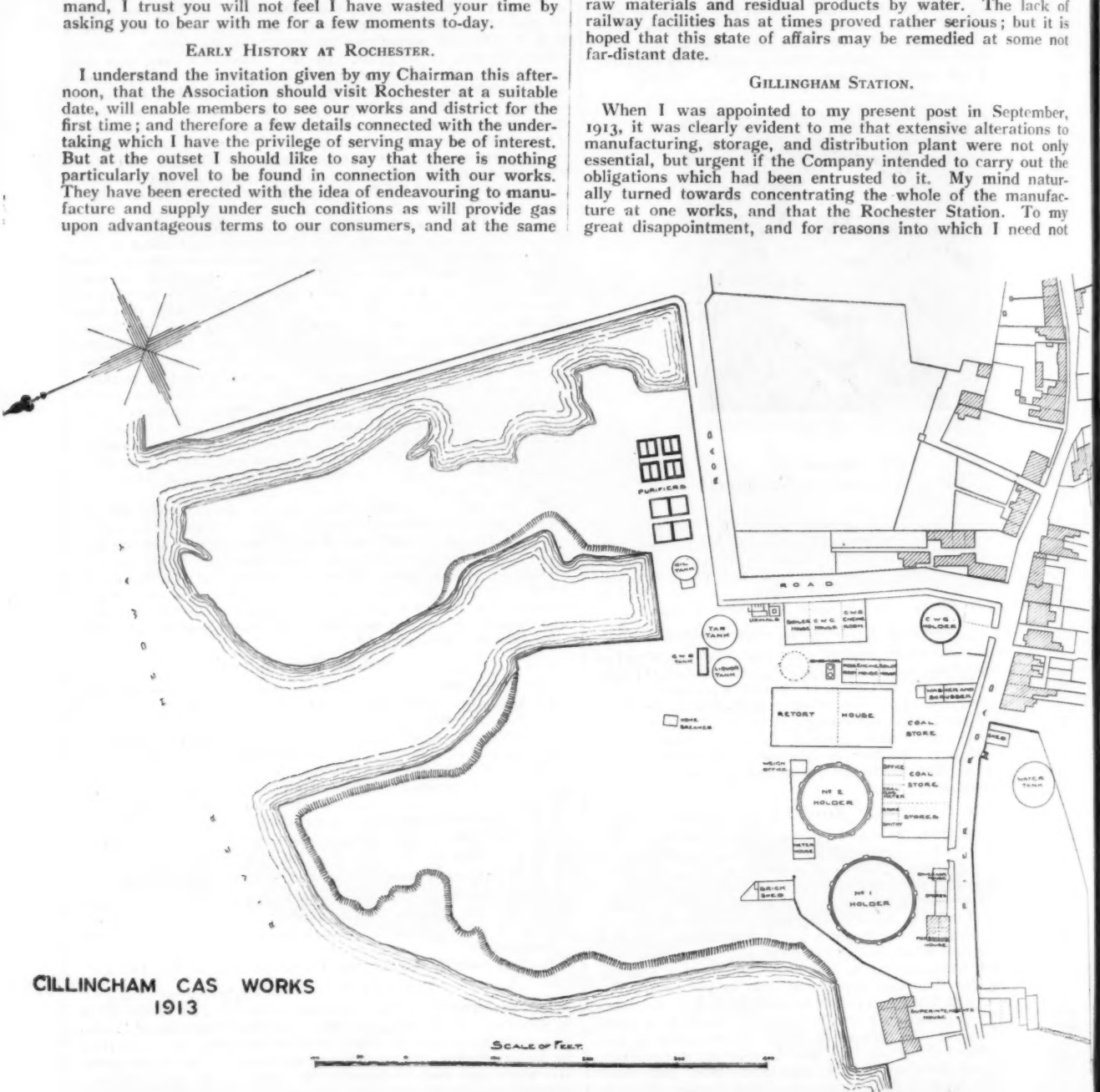


FIG. 1.

enter now, I found this could not be. I have always regretted the decision which had to be made then, and it is all the more galling when I realize that some five or six years later all the difficulties were removed. However, time waits for no man, and therefore the task of re-constructing the works at Gillingham (see figs. 1 and 2) was taken in hand without delay.

The old carbonizing plant, consisting of direct-fired hand-stoked settings, was replaced by an installation of Glover-West vertical retorts capable of producing 1½ million c.ft. per diem. These were put into action in 1915. The construction and working of this type of retort is so well known that I will not weary you with any details in regard to them.

Prior to the introduction of verticals, coal was removed from barges by hand labour, and taken to stores by cart. The boats are now unloaded by electric crane. The grab discharges into a receiving hopper situated immediately over a tray conveyor which carries the coal to a crusher, and thence by a system of gravity bucket conveyors either to the reinforced concrete coal store situated immediately alongside the retort house or direct to the coal bunkers over the settings. An automatic weighing totalizing machine is interposed in the tray conveyor, to record the weight of coal received. The coke is dealt with by means of a telpher, which delivers the material either to yard or to hoppers after grading and screening.

At the same time as the order was placed for new carbonizing plant, instructions were given for the erection of a gasholder having a capacity of 1½ million c.ft., and as soon as this was completed the work of repairing the two other holders was proceeded with. The new steel holder tank was constructed above ground, and stands upon a reinforced concrete raft 145 ft. in diameter, under which are 317 pre-cast reinforced concrete piles, some of which had to be driven 66 ft. below ground before the desired set could be obtained. An interesting procedure in connection with the building of the tank consisted of erecting and riveting-up the complete bottom and first ring of side plates on adjacent land, and afterwards transferring them bodily on to the piled foundations. This was done to facilitate completion of the holder.

The winters of 1913 and 1914 were exceedingly anxious ones, owing to the fact that manufacturing and storage plant was so inadequate; and it was often only by reducing works pressures that a continuous supply of gas could, in some parts of the district, be maintained throughout each 24 hours. Our difficulties were greatly increased in 1914 by the fact that, being situated in a naval and military area, many of our employees were Reservists, and consequently had to rejoin the Services immediately war was declared; but the most serious trouble was that men such as rivetters employed by contractors on structural work left and obtained employment in the dockyard. I only mention these matters, now happily in the far-distant past, because, trivial as they may appear at this moment, they are still vivid in my memory, and the reciting of them in these days of comparative peace will give some of the rising generation of gas engineers an idea of the difficulties which can be overcome when they have to face problems that appear almost impossible of solving.

In addition to the work already referred to, it was necessary to instal further coal gas condensers, washers, and scrubbers. The former are vertical, and either air or water may at will be employed as the cooling medium. All liquid residual purifying plant is capable of dealing effectively with 2½ million c.ft. of coal gas per diem.

The year 1915 saw the completion of a building 78 ft. long by 44 ft. wide, in which are housed exhausters, turbines for C.W.G. plant, and machinery for the generation of electricity.

The production of steam to meet the new conditions had to be dealt with, and therefore as soon as it was possible to demolish one-half of the obsolete retort settings this was taken in hand; and in this part of the old retort house two additional Lancashire boilers, each 30 ft. by 8 ft. 6 in., were installed, together with a brick shaft 93 ft. high, which is large enough to deal with four such boilers—there being room for two more within the same building.

New purifiers each 40 ft. square have been brought into use. The oxide for these and existing boxes is prepared by passing the material through a disintegrator of the usual type.

Carburetted water gas has been produced at these works since 1900, in which year two 500,000 c.ft. per diem plants were erected; but these were replaced in 1926 by two Humphreys & Glasgow plants. They are housed in the other half of the old retort house, the walls being raised in order properly to contain the apparatus. One plant fitted with waste-heat boiler is capable of producing 1,400,000 c.ft. per day; and the other, a back-run plant, has a capacity of 1,600,000 c.ft. per diem.

A new station meter (capacity 150,000 c.ft. per hour) of the ordinary type has recently been brought into operation, and

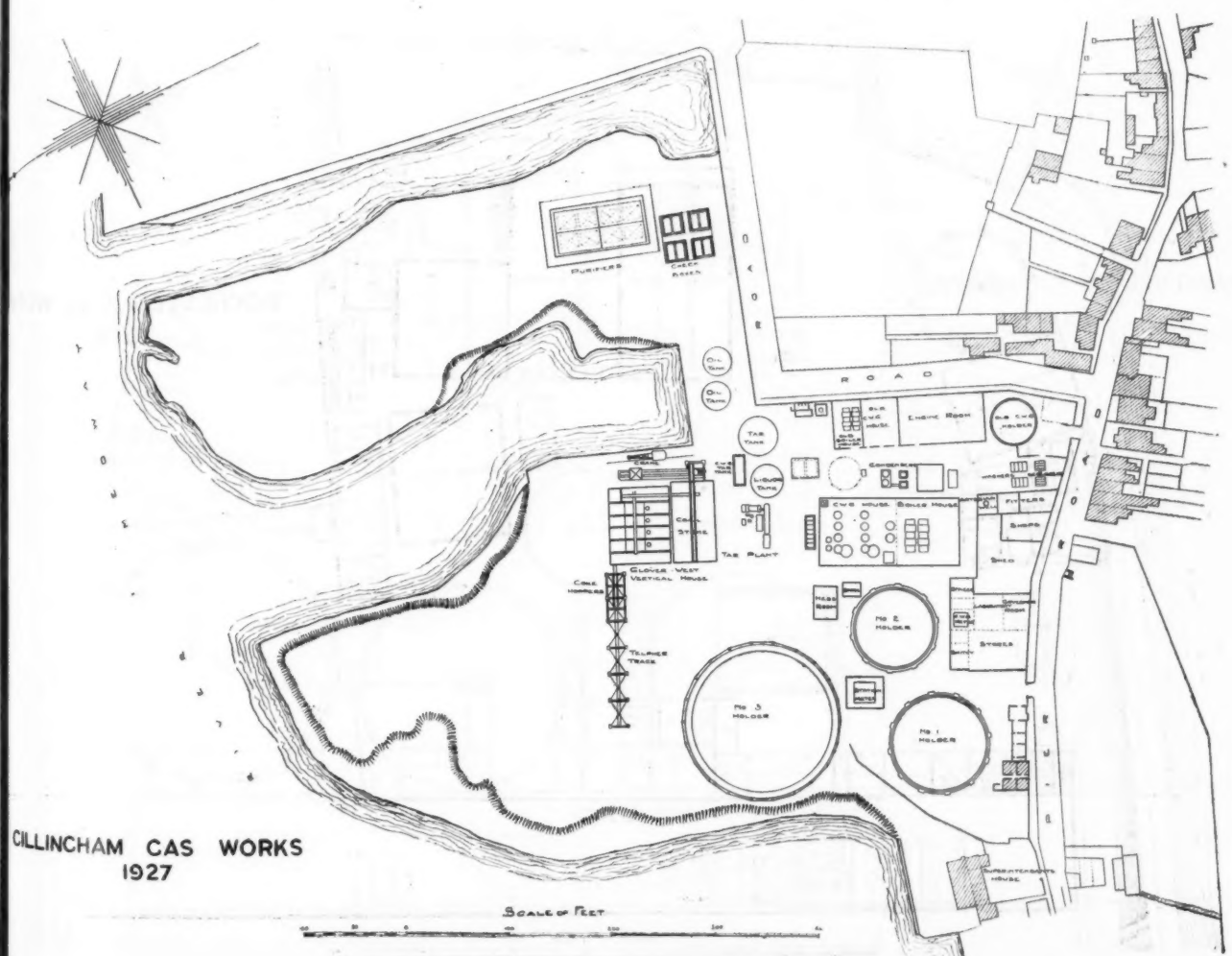


FIG. 2.

new station governors have been put down. The works have been properly equipped with laboratory, workshops, and stores.

There is only one other item of interest to which I would refer in connection with the Gillingham Station, and it is in regard to water supply. The town's water is considerably harder than we like; and therefore, in order that we might not only obtain soft water, but also be independent of the town supply, a boring was in 1924 sunk to a depth of 940 ft., and at that level water is procured from the greensands. We are always able to obtain all our requirements from this borehole (see fig. 3), from which, by means of a compressed-air plant, we raise water from a depth of 400 ft. There is no need for me to emphasize the benefits of soft water for use in boilers, particularly of the multi-tubular type; and I am delighted that the provision of such a well as I have referred to was decided upon and carried out.

Rochester Works.

The Rochester Works (shown in figs. 4 and 5) did not in 1913 require such drastic alterations as did Gillingham; but during recent years there have been considerable additions and improvements made, to which perhaps you will allow me to refer.

Until 1925 the carbonizing plant consisted of nine beds of eight retorts, each 20 ft. long, machine stoked and heated by regenerators. These were demolished, and within the same building it is possible to produce 80 p.ct. more gas by the erection of nine beds of ten retorts, each 22 ft. long. These are Ω-shaped, and are 24 in. by 18 in. in section. They are constructed of silica sections, but in passing I must say that I am not so satisfied with them as I anticipated. No doubt some of the troubles have arisen owing to the various causes to which Mr. Stephen Hay called members' attention in the paper which he presented to the Association in November last, the discussion of which we are to have to-day. They are charged and discharged by a De Brouwer machine, and the coke is removed to the yard or the C.W.G. plant, as desired, by a De Brouwer conveyor.

In 1922 two sets of C.W.G. plant were erected in a disused retort house. Each of these, fitted with a waste-heat boiler, can produce 1,250,000 c.ft. per diem. There is sufficient room within the building for one more plant of similar size, whenever necessity warrants its erection. The coke for these plants is supplied from an overhead bunker, which is fed by the coke conveyor previously referred to. For some years, blast product purifiers were employed for catching the dust when the stack valves were opened. As these were not entirely satisfactory, and were very expensive to maintain—to say nothing of the cost of pumping the necessary water—"Centriflovane" grit catchers were installed in 1927, and after minor alterations have proved extremely efficient. Any member who did not have the pleasure of hearing Mr. Auchterlonie on this subject at the Eastern Section meeting last year will appreciate the value of those meetings when I say it was in consequence of the experience gained at Cambridge that I installed these devices, which, as I have already stated, are not only efficient, but cost nothing to run. Up to the present I have nothing but praise for them; and those members who are experiencing difficulty let me assure that it is an easy matter to remove their anxieties in this direction.

Additional coal gas condensers are shortly to be erected. New wet purification plant in the form of Livesey washers and Holmes rotary scrubber-washer fitted with Noden buckets has proved itself efficient.

All engines and machinery have been centralized in one new building; the purifiers have been converted to the luteless type; and, lastly, the gas, before entering the holders, passes through a new station meter of the usual design, which apparatus will deal with 150,000 c.ft. per hour.

The holder capacity of this station is only 1 million c.ft.; but we have been enabled to postpone the erection of more storage by installing turbo-boosters, so as to provide at all times whatever pressure may be required at the station governors, notwithstanding the fact that the holders may be only partially inflated. As at Gillingham, a suitable laboratory has been provided.

The workshops at this station are the best that can be arranged at the moment. They are small, and the stores and various other shops are not all that can be desired; but it is hoped to correct this very shortly by erecting new buildings which will be of such design and dimensions as to permit of the housing under one roof of shops, stores, and cooker cleaning plant, and all other work appertaining to the distribution department.

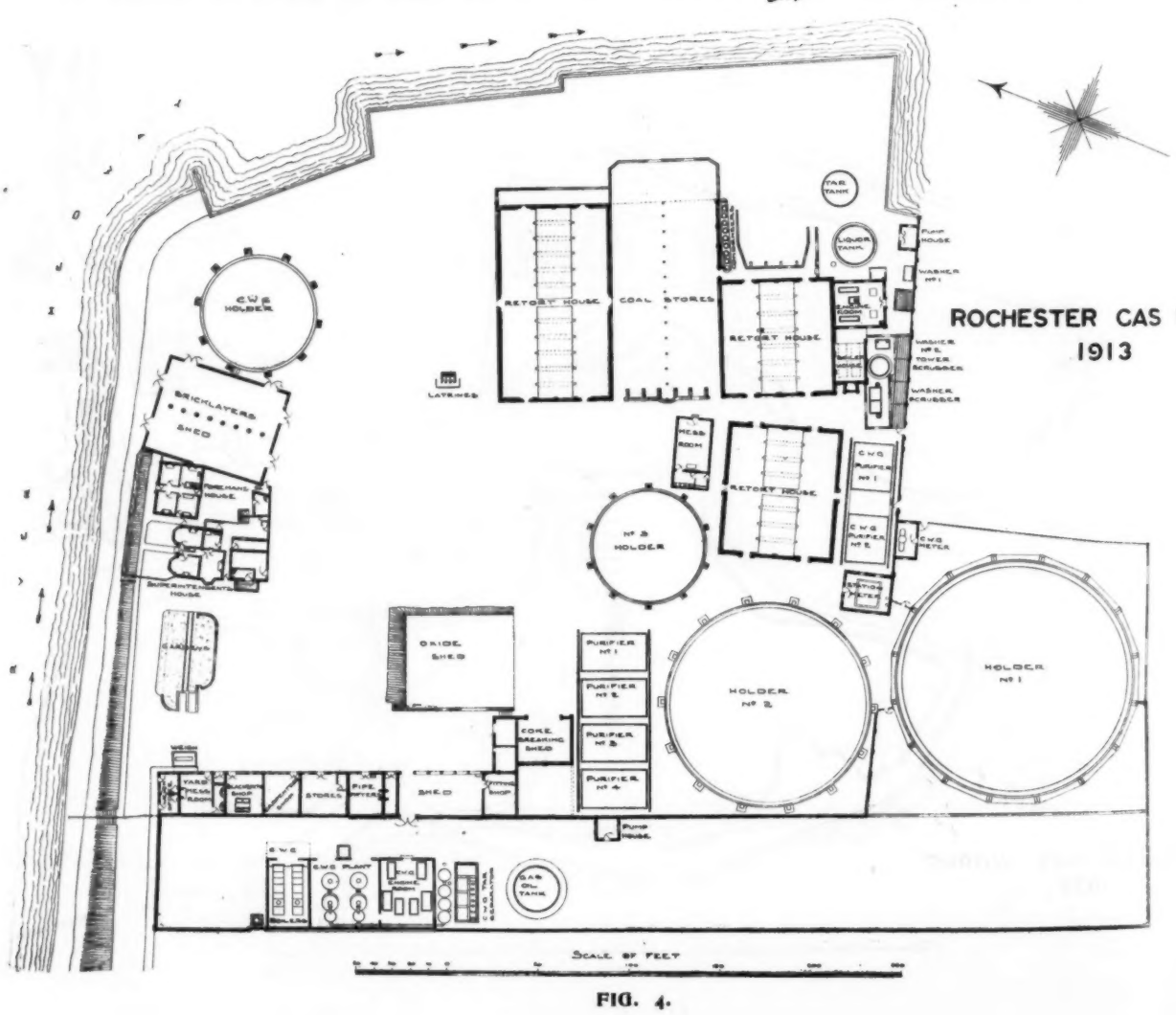


FIG. 4.

An artesian well (see fig. 6) 741 ft. deep is in use at these works, and from the greensand soft water overflows in such quantities as to render pumping unnecessary.

I think, gentlemen, that is all I have to say in connection with our manufacturing department. There is nothing extraordinary in those remarks to which I would call your special attention, but I feel they do represent a considerable amount of work executed in somewhat difficult circumstances. I wish no credit to be given to myself, but rather would take this opportunity of expressing my thanks first of all to the Directors of the Company for adopting a bold policy in sanctioning the spending of money on modern plant, and secondly to my Assistants, Works Superintendents, and the workpeople employed by the undertaking. Without the co-operation of all concerned, I feel I should not be able to give the record I have presented to you.

Statistics.

The following figures in regard to gas made and accounted for, also capital per million sold, may be of interest. I give them in periods of five years, the first date being 1912, which was the year prior to my appointment.

Year.	Gas Made, Millions.	Gas Accounted for, Millions.	Capital per Million Sold.
			£
1912	573	522	338
1917	740	670	421
1922	820	749	389
1927	968	905	359

Further, 29 additional miles of main have been laid since 1912, and the number of consumers is now 28,650, as against 17,954 in that year. I give no figures as to the miles of main which have been substituted by larger sizes; but this has been a somewhat extensive task, for the reason that our district is in many parts one that has been in being for a long period, and consequently mains originally laid to supply gas for lighting proved no longer big enough to provide an adequate supply for the many other uses for which gas is now employed.

Workpeople.

I have previously referred to the fact that my Directors are ever mindful of the welfare and comfort of their workpeople. In addition to the provision at each works of mess-rooms properly equipped with baths and clothing lockers, the Board have seen to it that the leisure hours may be spent in the open on a sports ground, where cricket or football, according to the season, may be indulged in, as well as tennis and bowls. I am sure these facilities are much appreciated; and although I am fully aware that there is nothing unique in the provision of such playing fields, yet I would, if I may, say that even the smallest undertaking should attempt something in this direction. Workmen are intensely human, and I am positive that if they are encouraged to take part in clean and healthy sport they are better beings both physically and mentally. Even if looked at merely from a mercenary point of view—and I can hardly think there would be many undertakings who would study it from that angle—I say it is a business proposition. It gives an opportunity to all men to come together; and by so doing, corners are rubbed off, and there is a better understanding, not only of the difficulties of each other, but those of the concern which employs them. To any gas undertaking not having made this experiment may I again be allowed to suggest they should do so? If, in addition, they can see their way clear to arrange, as we do, a sports day annually—the Company providing prizes and tea for the men, their wives, and families—so much the better.

Flooding of Works.

Many years will pass before Jan. 6, 1928, is forgotten by those persons living in, or owning property near, tidal rivers such as the Medway, for during that night death and destruction stalked through those areas. It will be remembered that about midnight an abnormally high tide occurred, and it may interest you to know what happened at our Rochester Works.

I should, however, commence my remarks by saying that the ground level of a portion of these works and the roadway leading to them is about 10 ft. below the river wall. In addition, there are many acres of marsh land around them, all at this low level. At about 11.45 p.m., it was noticed that water had begun to run over our wharves, and in a few moments it was obvious that something unusually serious was about to take place. This overflow soon became a torrent, but it ceased almost as quickly as it had arisen. If the quantity of water which came over our sea wall had been all that we had to face, things would certainly have been troublesome, but not serious.

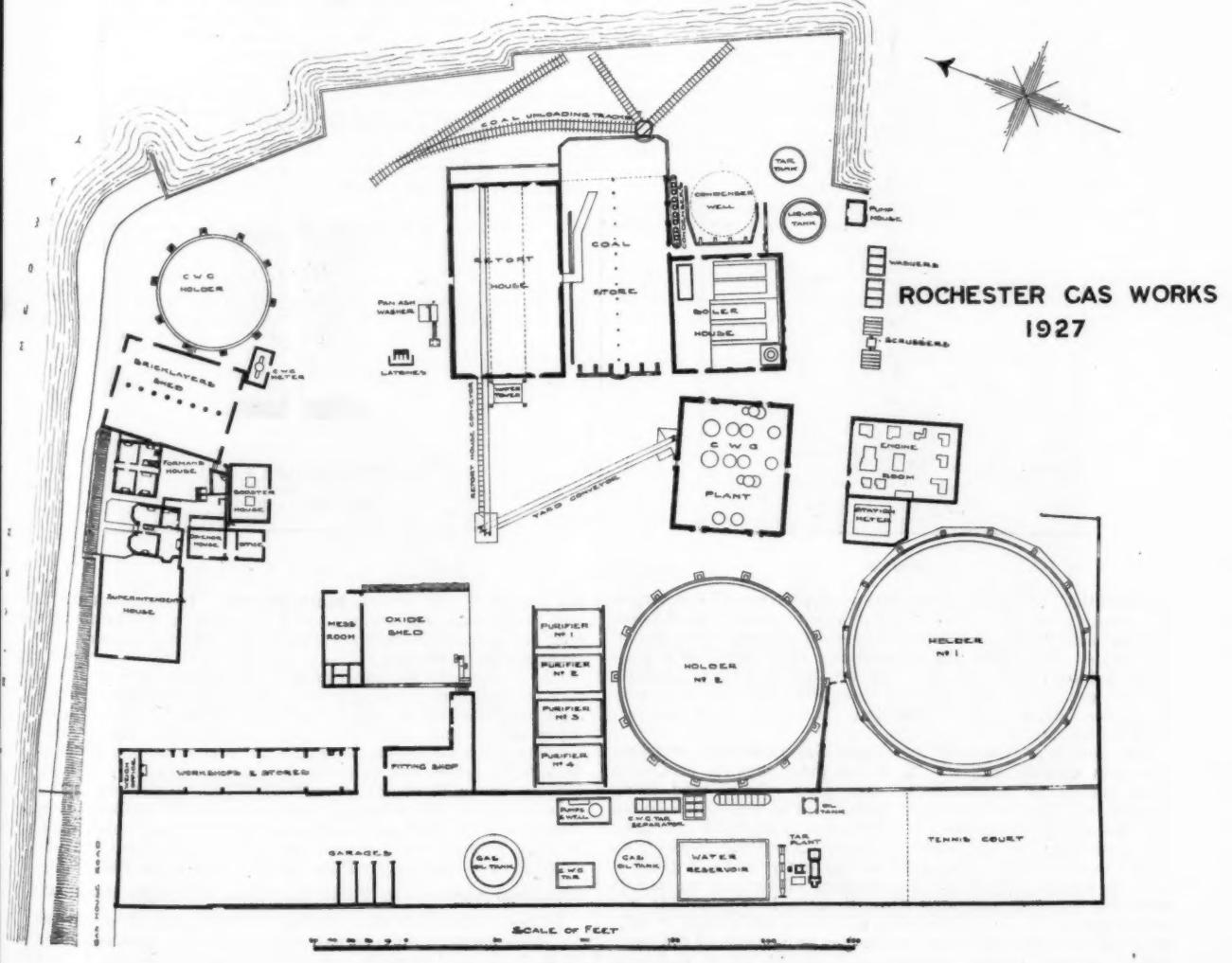


FIG. 5.

As, however, the tide swept up the river it overflowed the wharves of some of our neighbours, and in less than ten minutes from the first warning the whole of the marsh land, roadway, and a large portion of our works were flooded to a depth of over 5 ft. To deal with such conditions is bad enough in the daytime, but far worse during the hours of darkness.

The first thought that came to the minds of those on the works was to prevent the flooding of the basement of the retort house; and it is a matter of pride to me to record the fact that the steps taken by those men certainly saved the furnace fires. The water entered the flues of the Lancashire boilers, but only to the extent of a few inches. The exhauster house and C.W.G. plant, as well as the purifiers and station meter, suffered practically no damage beyond that of the flooding of pipe trenches. Underground tar and liquor wells were, however, filled to overflowing. One of the greatest difficulties was in regard to the elevation of coal. The conveyor to, and the boot of, the elevator were entirely submerged; and for some time we were obliged to hoist the material by hand labour to the overhead hoppers in 1 cwt. sacks. The offices, stores,

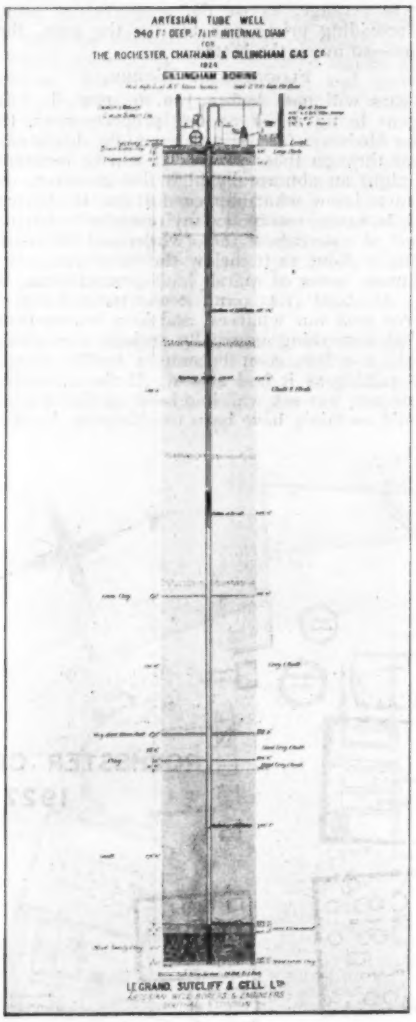


FIG. 3.

blacksmiths', carpenters', and fitting shops were all submerged to a depth of about 4 ft. 6 in. The booster house was flooded, and the electrical gear therein seriously damaged. The station governors, fortunately, in consequence of a previous experience (before I took charge), are situated about 12 ft. above ground level, and were therefore safe; but they could not easily be approached, because the building containing them was surrounded by 4 ft. 6 in. of water.

The houses provided for the Works Superintendent and Day Foreman were flooded, and for two or three days the occupants were compelled to remain in the upper rooms, food being handed into them by means of ladders. The men's mess-room and the well-pump house were flooded to a depth of over 4 ft. For three days the only means of getting about the greater area of the works was by boat, and during that period our greatest anxiety was in regard to the pumping of the various works syphons, as well as those situated immediately outside the works gates. It was not because we had no knowledge of their position that difficulty arose, but rather on account of the enormous amount of coke, clinkers, and rubbish which had been washed over the boxes. The situation was aggravated by the extremely low temperature of the water, and although men were provided with waterproof waders, yet hands and arms soon became useless when immersed for the purpose of endeavouring to locate exactly, and when discovered, raise the syphon box covers.

You can hardly imagine the state of affairs when the water was drained off, which work was only accomplished by taking the drastic step of making several cuttings through the river walls. These cuttings could, of course, only remain open for a few hours during the time that the tide was falling; and then as it rose, so we filled the breaches. This work was continued for many days, until practically all the water was off the land. You will probably think that sluices should have been provided in normal times to meet such an affair as flooding, and I can assure you that such was the case; but the enormous amount of débris swept onward by the first rush of the torrent soon choked the pipes leading to them, and they became useless. On Tuesday morning, Jan. 10, we were able to see what had to be faced in order to endeavour to get the state of the works into something approaching normal condition, and I can safely

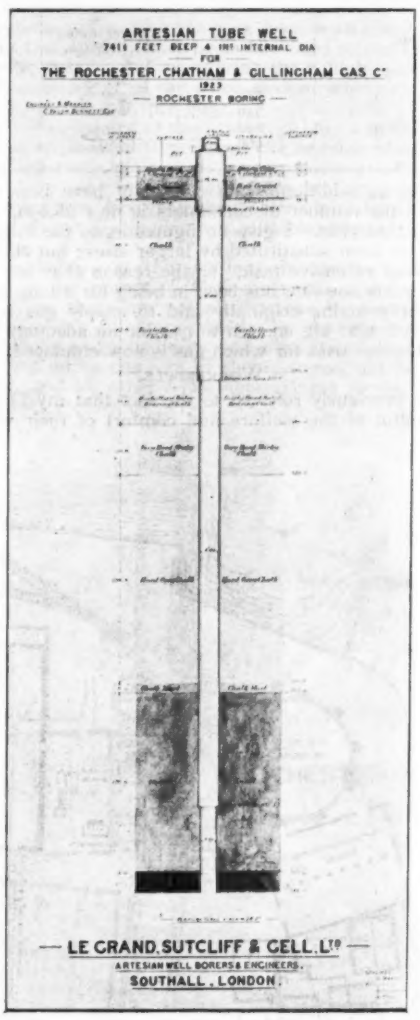


FIG. 6.

say the sight was almost heartbreaking. The amount of silt and sludge was astounding, and I fear that it will be many a long day before we can eradicate all signs of the disaster. The photographs appended will, I hope, give you an idea of some of the difficulties we experienced; but words entirely fail to give you an adequate description of our anxieties. The Gillingham Station of the Company suffered no damage, although the water at one time was within 9 in. of the fires. Finally, may I say that the gas supply to the district was in no way affected? Very few consumers ever realized how near they were to being without adequate means of cooking, lighting, and heating. I should like to take this opportunity of publicly thanking those members of the staff and workpeople who worked unceasingly, in most trying circumstances, in order to safeguard the property of the Company, and the supply of gas in the district.

Everyday Affairs and Their Relation to Future Progress.

In these strenuous days, which pass so quickly, and which are often spent in our concentrating upon some particular problem or phase of work in connection with the industry, I think it well at times to pause for a little while for the purpose of

LOOKING FROM RIVER BANK TOWARDS THE RETORT HOUSE.
(Rochester, Jan. 7, 1928.)

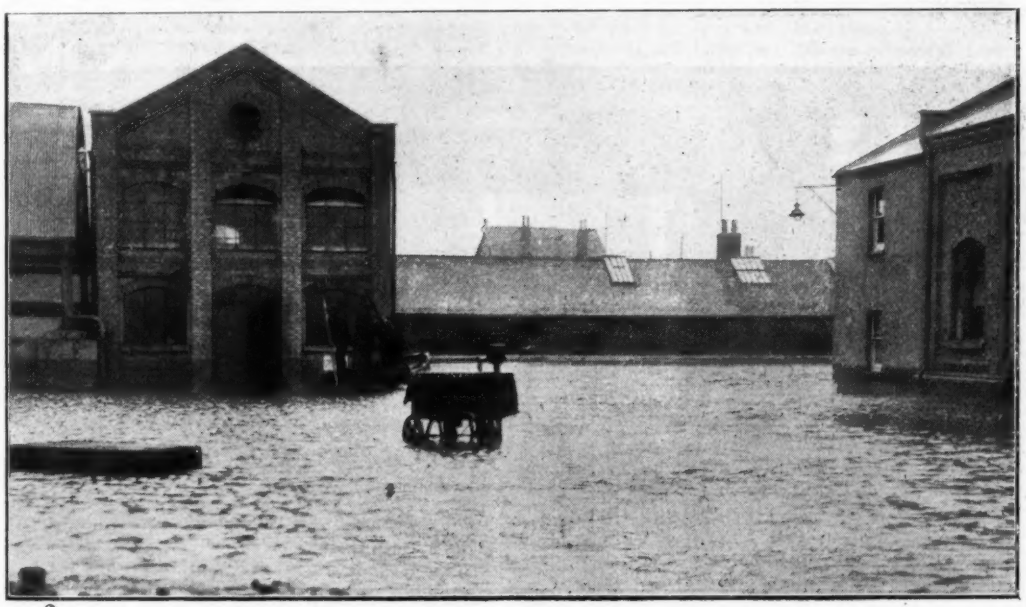
taking stock of the general position, and of examining that which constitutes "the daily round and common task." You will, I am sure, be relieved to know I do not intend to deal with all the varying work which engages our attention; I merely propose to make reference to one or two items which some may consider minor ones, but which I think sufficiently important to be worthy of consideration. I should, however, like to preface my remarks by saying that in speaking to-day, among other things, of various methods by which I am of the opinion the tone of the industry may be raised in the eyes of the public, I realize you may not all agree with me. I can imagine, if custom permitted the discussion of a Presidential Address, many lively things might be said in the debate, for of course everything depends upon the individual point of view. For instance, you could not convince a mouse that a black cat is lucky. Therefore, if you are not in full agreement with me, I trust you will at least appreciate that my suggestions are the result of careful consideration. Please do not think I am by any means satisfied that we in Rochester and district are nearing perfection. I realize that is a state we can never hope to attain; but being aware of our shortcomings, we are at least endeavouring to correct them.

Coal.

This being our chief raw material, I am amazed to find that in many works the question of ascertaining the quality of coal as and when delivered does not receive the attention which, in my opinion, is essential. I fully appreciate that those undertakings employing chemists do regularly sample and analyze their coal as received, but there are a great number of concerns which have no system in this important matter. I realize that the method of taking samples is a somewhat controversial one as between sellers and buyers; but it *is* possible for an agreed method to be arrived at between the two parties, and every effort should be made in that direction, for unless agreement is come to there will always arise those interminable arguments which we know from experience result in bad feeling and no satisfactory conclusion. In addition to the tests made by our staff, we have an arrangement with a firm in the North who take representative samples as the material is being loaded into ship. The procedure adopted by that firm is agreed to between the Company and the coal factors, and we each acknowledge that the result of their analysis shall be accepted by both parties. To those who have no works chemists, I would say that it will pay you to take samples *regularly*, and submit them to some independent person for analysis. The expense thus incurred will be repaid many times over.

Carbonizing.

For many years past there has been a striving (until it has become almost an obsession) to produce the highest number of therms per ton of coal carbonized. To do so is, on the face of



PART OF THE YARD VIEWED FROM THE RETORT HOUSE.
(Rochester, Jan. 7, 1928.)

THE STORES AND WORKSHOPS.

(Rochester, Jan. 7, 1928.)

it, a most laudable achievement; but here may I emphasize a note of warning which has been recently sounded? It is perhaps somewhat difficult with some small undertakings, where, as we know, the manager is often occupied not only during his wakeful hours, but also during those which should normally be spent in sleep, for proper costing systems to be in vogue. He has no time to give to intricate details, and to him I would address the words of Mr. T. Carmichael, in presenting his excellent paper to the Institution of Gas Engineers last year, when he said: "The most efficient process thermally is not always that which offers the most economical *commercial* result."

While, therefore, no effort should be spared to see that there is no waste, yet it *is* possible to carry matters so far that, instead of saving money per therm produced, the balance is on the wrong side. To those gentlemen who make daily boast of their make per ton, I repeat: "Be quite sure your overkeenness is not costing your undertaking money."

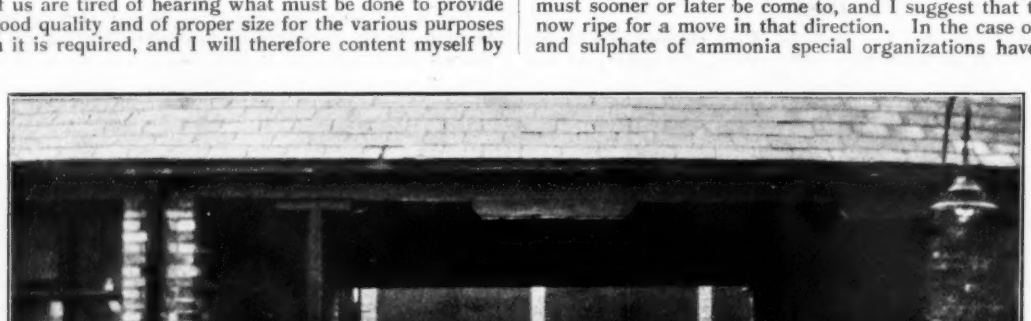
COKE.

The charges for gas are so largely affected by the prices realized for residuals, that I feel it will not be out of place to refer to them.

Most of us are tired of hearing what must be done to provide coke of good quality and of proper size for the various purposes for which it is required, and I will therefore content myself by saying that unless the production *and marketing* of this class of fuel is dealt with in a manner not dreamed of a few years ago, the position will be more serious than we have ever known.

Those responsible for administering gas undertakings within comparatively easy reach of London and other great cities have what I consider legitimate cause for complaint in regard to coke matters. The provincial undertakings spend money and time in creating a market for coke, only to find that their efforts are benefiting everyone except their own works. I mean by this that directly steps are taken to educate the public to use coke, the large producers absorb the trade by sending fuel into the district at lower prices than those ruling at the local gas-works. This, in turn, compels the gas undertaking to reduce its charges below the "foreign" coke prices, and so the war goes on. It may be argued that this is good from the consumer's point of view, but for many reasons I doubt the truth of that statement. Please do not misunderstand me. I do not wish to suggest in any way that an unreasonable price should be charged for coke or any other commodity, but I do suggest that the public should be called upon to pay a fair figure. This cannot be, as long as the big producers adopt the present attitude.

Arrangements with regard to the disposal of surplus stocks must sooner or later be come to, and I suggest that the time is now ripe for a move in that direction. In the case of gas, tar, and sulphate of ammonia special organizations have been set



ENTRANCE TO THE GARAGES.

(Rochester, Jan. 7, 1928.)

up to foster the use of, and care for, each of those particular materials; and it is beyond my comprehension why Coke Associations—embracing, if necessary, our friendly competitors the oven coke producers—should not be formed for the purpose, not only of regulating supplies and prices, but of making the uses of coke far better appreciated than at present. I know there are great difficulties to be overcome; but they are possible of solution. At the moment, gas coke is not the pet child of any particular organization (except perhaps the London Coke Committee), but I submit it is of such importance as to warrant it receiving, as I have already stated, the sole attention of some Association which can give the time, labour, and money to enable it to take its proper place in the realm of smokeless solid fuel.

Tar.

My remarks with regard to tar must be brief. It is hoped that the recently-constituted British Road Tar Association will do much to assist in maintaining and extending the use of tar in this country; but although it may have the highest ideals and ambitions, it cannot succeed unless manufacturers and distillers of tar see that the material they sell is of the highest quality for the various purposes for which it may be used. Standards are being—or perhaps I should say have been—set up to meet the requirements of the road authorities; and if it is impossible for ordinary gas-works to meet those standards, then the crude tar must be sent to distillers, where the production of suitable material will have the sole attention of those persons who have made a life study of such matters. It is only by these means that we can hope to meet the acute competition with other preparations which are being sold for treating road surfaces.

Maintenance of Works.

In regard to the general conditions of gas-works, I would like to say it must be a matter of great satisfaction to all concerned that there has, during recent years, been a decided and successful attempt to maintain good plant in such a state of repair that it continues to remain efficient. There is usually in the larger works a system in vogue which compels this attention, but there are still some undertakings which do not appreciate that true efficiency can never be obtained where there is a lack of cleanliness, order, and good lighting. To some it would appear that money spent daily and continually on these matters is wasted, but I can assure them the reverse is the case. Those whose duties take them into places surrounded by dirt and disorder soon become slack, and have no pride in their job. They are glad to get away, and sorry to return. So much importance do I attach to creating in the minds of workpeople the feeling that they are not performing tasks merely for the purpose of earning sufficient money to keep body and soul together, but rather that they are engaged upon work of a constructive nature, and one of supreme service to the community, we do much to achieve that result. I am convinced that, so long as men can be kept in that state of mind, there is a spirit of willingness abroad, the value of which can be measured not only in pounds, shillings, and pence.

Visits to gas-works by members of Rotary Clubs and Chambers of Commerce, students at Technical Institutes, and senior pupils at both boys' and girls' schools should at all times be welcomed, provided that the works are in a fit condition to receive them. In many towns comparatively few persons have any idea of the plant employed, or the methods adopted, in gas manufacture; and although the gas-works may be, if not the only, certainly one of the largest local manufacturing concerns, it is rarely visited, because there seems to be an opinion abroad that there is nothing worth viewing, and certainly nothing worth getting dirty for by so doing. If, however, the works are *always* clean, it is surprising what a different impression is made upon the minds of visitors. The chief inhabitants, being members of organizations such as I have mentioned, after an inspection begin to realize the importance of the gas industry in their neighbourhood, and scholars will look upon gas with far greater interest in the future. Anything that can be done in the direction of educating the rising generation in regard to gas matters is worth while. We all advise "gas for cleanliness," and therefore the works at which it is produced should be as clean as it is possible to make them.

Please let me appeal to those few undertakings who have not, because of other pressing matters, made a special effort to keep their works in an orderly manner, to spend money on the experiment, and I am sure they will be surprised at the result. Breakdowns will not occur so often, and when one does take place it will much sooner be remedied; and altogether there will be a general improvement in the tone of the undertaking, with a consequent increase in profits.

Showrooms.

One of the things which occurred to me in 1913 was that my Company had no showrooms, and I was determined that this state of affairs should be remedied as soon as possible. I realized that delay must, however, take place, because it was of not the slightest use endeavouring to educate consumers as to the value of gas until we were able to meet any demand which might be made upon us. In the year 1919, it was decided to alter our chief offices so that the ground floor might be converted to showrooms, and that the other part of the premises, then in the occupation of my assistant, should become offices. This work was completed, and so satisfied were my Board that the policy was the correct one that premises were also acquired in the High Street, Gillingham. I hope that the new building we are erecting in Chatham will be completed in time for your inspection this spring, and you will then see we are there making arrangements for showrooms, a cookery demonstration theatre, &c. It is also hoped to open shortly a district showroom at Rainham.

While dealing with the question of showrooms, I should like to add that it is still possible to find premises in various districts which are designated showrooms, but which are apparently open only for the display of dirt, dust, and disorder. I well remember seeing two such places last year—mark you, they are situated in towns of no mean size. In one were a number of brown paper parcels, which had been dumped in the window enclosure by the delivery agency as the nearest convenient spot, and it appeared to be the business of nobody to remove them for at least three weeks to my certain knowledge. In another case a bath had been fitted, and at the foot of it a geyser. Water had been placed in the bath, and in the course of time a film of dust had formed on the surface. I presume the idea of the display was to attract the public—it certainly did, and conveyed to the mind of the layman that water issues from a gas heated geyser in a dirty condition. I cannot conceive how it is possible for such a state of affairs to continue. Showrooms should be our best advertisement, and by their appearance will the undertaking be largely judged.

Mains and Services.

Many of us have suffered severely for the sins of our predecessors in regard to no records having been kept of the positions of street mains and services; but after having had the experience, I can assure you that, tremendous task though it may be to ascertain the position of all mains, it is not an impossible one. In my undertaking, I regret to say there was no proper record kept until recent years, but I am pleased to inform you we now know exactly where all the mains are situated. In this work we have made great use of the wireless pipe locater—an instrument of profit which should be possessed by every undertaking. In the case of my Company, it has saved us many hundreds of pounds, it has enabled us to deal with work promptly, and has saved the unnecessary tearing-up of thoroughfares, which is always considered by the public an unmitigated nuisance. The whole of the records of our mains and services are kept on the system indicated by Mr. Sandeman some years ago, when he provided the Association with information which I believe is universally looked upon as one of the most valuable contributions to our proceedings. Let me assure engineers of some of the smaller undertakings that the system is one which can be adapted to meet their requirements. It may *look* complicated, but I can safely say it is not so; and when once adopted there is no need to tremble and quake when one learns that the old and trusted chief mainlayer is lying ill, and that he will possibly take with him, on that long journey from which there is no return, the record of the positions of the mains within the area of supply.

Before leaving the subject of mains and services, I should like to consider for a few moments the probable conditions *inside* those pipes when passing partially dried gas through them. We all realize that at present they must of necessity contain considerable quantities of dust consisting largely of rust, but because the gas is moist this remains in the pipes, and does not often cause trouble in services and meters. Remove this moisture, and I fear we shall be presented with a problem the only complete solution of which would be the sweeping of all mains. We have recently found it necessary to sweep a 14-in. main 860 yards in length, which was laid many years ago, and the solid matter removed amounted to no less than 1½ tons. Do not, please, assume that I am in any way trying to belittle the benefits which accrue when sending out "dry" gas. That is far from my intention, and my only reason for bringing the matter to your notice is because it is one which, in my opinion, must be borne in mind.

Meter Indices.

Members of the Eastern District have heard me speak on the question of meters and their indices, and I therefore apologize to them for taking up their time in making reference to the matter again this afternoon. I do so only because I feel this is a most important subject. I say "important," because I sincerely believe wherever there is dissatisfaction shown with regard to gas accounts it is usually because so few consumers can read their meters correctly. The gas meter is, as we all know, an excellent piece of apparatus, which gives good—and by this I mean reliable—service under conditions which are often so unfavourable that nobody would dream of expecting any other piece of mechanism to work accurately if fixed in similar positions; and therefore, knowing, as we do, how comparatively rarely a meter registers against the consumer, it does seem a great pity that it should be suspect in the eyes of those who have to pay for the gas it measures.

Now, why is there this suspicion? In my view it is because the index is not easy for the ordinary man or woman to read. Tens of thousands of leaflets have been distributed throughout the country giving instructions on the matter, but the result is

comparatively negligible. It is true that gas meters have often been fixed in such inaccessible positions that it is a real labour to get to them, and such being the case we cannot expect the housewife (for I fear she is the person who has to suffer when her husband receives a gas bill rather higher than he anticipated) to climb over coal and other such materials once a week to check the gas meter, as she does the tradesmen's weekly or monthly books. Assuming, however, the meter is in such a position as to render its examination easy, it will rarely be done unless it is capable of being read with as little trouble as that of the milometer on a motor car.

With this in view, I have been experimenting with indices (see fig. 7) which are foolproof as far as reading is concerned. Please do not confound these with what was known as Harding's patent counter, which proved of practically no value, because it was possible to see more than one figure on each dial, thus causing much confusion. With the attachment we are trying, it is impossible to make an error in taking the index. In addition, I am pleased to say we have found that housewives are now quite willing to make the reading of their meters part of their usual routine work. I hope by this means to eradicate dissatisfaction, and by so doing gain goodwill, and probably increased consumption, for I am of the opinion that the average man does not mind paying for something which he has had and which he knows has given him service, but the same person who cannot understand his meter index is firmly of the opinion that all gas meters are disciples of Ananias. Anything that can be done to merit the confidence of consumers is worth while, and I suggest that this matter of easily-read meter indices is worthy of serious consideration.

Lighting Load.

The blessing of all political parties has been given to our electrical competitors, but as far as I can see at the moment they are none too happy under the new régime. Whatever may be the ultimate result of recent legislation with regard to electricity, it is well that we should place ourselves in such a posi-

FIG. 7.

tion as to be able to ward-off all attacks whenever they may come. *We* are all quite sure that the gas industry, instead of being a dying one, is only just commencing to reach manhood, and therefore it is not only up to us to see that gas is used in increasing quantities for purposes not contemplated a few years ago, but it is essential that we make a sustained effort to retain the business which has been ours for ages—and I refer particularly to the lighting load. I have met gas engineers who seem quite resigned to the possibility that gas lighting is eventually bound to be superseded by electricity, but I cannot help thinking such gentlemen do not fully realize what they would lose in output if such a state of affairs actually came about.

From figures abstracted from the returns of my Company, we estimate that the average consumption of a coin meter installation consisting of three lighting points and a gas cooker is approximately 25,000 c.ft. per annum; but if the gas lighting is abolished, the consumption is about 15,000 c.ft. per annum, or a reduction of 10,000 c.ft. a year. Now, with 16,750 coin meter installations, it will be readily seen that if no gas were used for lighting our sales would drop by no less than 167,500,000 c.ft. per annum, which is equal to 18·7 p.ct.; and, mark you, this is only in regard to coin meter installations. Add to this the loss that would be occasioned by *all* consumers using some other illuminant, and you will soon appreciate what a considerable amount of our business is bound up in lighting.

I have heard it stated that electricity will not for many years find its way into the houses of what are known as the working classes; but make no mistake about it, there are schemes presented to the occupiers of such houses which are so tempting that they can hardly be refused, and once the bargain is made I fear the glamour of being able to adopt the same illuminant as is employed in many large establishments is so great that gas lighting becomes one of the things to be spurned. Let us, therefore, see to it that we are not like ostriches burying our heads in the sand; rather let us do all we can not only to obtain new business, but by making a really big and sustained effort retain such consumption as that to which I have referred.

Public Lighting.

In many areas the work of lighting the various thoroughfares is entrusted to the local gas undertaking, and I must admit that in a large majority of cases the work is carried out exceedingly well; but there are still too many districts where there is much room for vast improvement. I realize that the numbers and positions of lamps are usually decided upon by persons other than those who have made a study of illumination, but even so there cannot possibly be a legitimate reason why the service which the local authorities have the right to expect, and the gas undertaking should be pleased to provide, is lacking.

For some years past, I have paid particular attention to public lighting in the various districts through which I have travelled, and in more cases than I care to think of the state of affairs is not as it should be. I have seen many instances of columns not being perpendicular, and even if they are so the lanterns are often not fixed squarely. I have one particular place in mind—and I may say it is not a small town—where many of the columns and lanterns are not only in the condition I have referred to, but, in addition, panes of glass which have cracked, and should be replaced, are daubed with putty and brown paper to hold them together. You may imagine the state of affairs existing in regard to the burners and mantles. I do not wish to infer that such disgraceful conditions exist in many places, but it is a fact that this work often does not receive the careful attention which is warranted. It has been stated over and over again that public lighting does not pay; but I yet fail to see why it should be an expense, and I feel certain it can always bear, if not a direct profit, certainly an indirect one, provided the matter is dealt with properly. Street lighting should be one of our best advertisements, and it will be so if it is of such a character as to create a good impression in the minds of those who use the roads at night. If, on the other hand, the lighting is bad or the apparatus in wretched condition, the impression made will be that the local gas undertaking is asleep in *all* matters; and it supports the erroneous idea that gas lighting is a thing of the past.

I would suggest that the subject is worthy of careful examination and continued study by each of us. Let our street lamps proclaim we are not a moribund industry, and that the best light is gas light.

Training of Youths.

Those of us who had the pleasure of visiting Watson House last year were, I am sure, much impressed by the vast amount of work being done to ensure that the materials used on the district were of the right quality, and also that the youths being trained for fixing various apparatus and every other kind of work in connection with the distribution department were receiving excellent education. I only wish that other such establishments were available to the whole industry, so that the lads might be trained to become eventually first-class fitters. I know full well some undertakings are large enough to be able to, and do, run their own training shops; but there are so many small concerns which, perhaps because of their geographical position and other conditions, cannot do so.

The importance of employing first-class men does not need emphasizing by me. There is room for hundreds of such fitters within the industry, and I am of the opinion that it would be well worth while further investigating the problem of training men so that all gas undertakings may, in the near future, only employ persons who, when sent on to the district to execute work, may carry it out in a *really* satisfactory manner. I know of a recent case where a showroom attendant sold certain water heating apparatus, but not one of the so-called fitters employed by the undertaking could fix it properly. Naturally the consumer was much annoyed, and rightly came to the conclusion that nobody in the employ of the concern knew his job. He was, however, determined that the apparatus should be fixed so as to give the desired results, and at last the gas company had to apply to a neighbouring undertaking for assistance. That is the kind of thing which is letting the industry down.

It is usual for fitters to have mates to assist them, and I submit that if the fitter himself is not a really first-class man the mate cannot possibly learn his trade properly, and whatever knowledge he may acquire is not in the best interest of employed and employer. I know that the creation and maintenance of Central Training Schools such as I should like to see set up would, on the face of it, appear to be costly; but when the advantages which accrue from undertakings sending youths to receive proper education are fully appreciated, I am sure the expenditure involved would prove a remunerative investment. The schemes already in being for the training of men are excellent as far as they go, but I submit greater vision in this matter is needed. It must be made possible for *all* gas undertakings to arrange for the adequate training of youths as competent fitters, and thus in time prevent the repetition of cases similar to the one I have described.

Press.

The gas industry has good reason to be proud of, and thankful to, its Technical Press; but with the knowledge that I may be on very thin ice, I venture to address you briefly in regard to gas matters and the *National* Press. I am sure everyone

will agree that the English daily papers are second to none in the whole world, also I am certain you are with me when I say I am positive it is the wish of every newspaper proprietor and editor that only the truth shall appear in his publication. It is, however, a fact that the gas industry does at times suffer when it does not deserve it, and in this connection I refer to the large headlines or posters bearing such startling words as (say) "Three men gassed." The public is extraordinarily apt to think that all gas is of the same nature, and that it can only be generated at a gas-works. People jump to the conclusion, when reading such a statement as I have referred to, that gas distributed for domestic use is the material which has been the cause of a disaster, whereas in truth it may be that the trouble arose in the hold of a ship which was at the time perhaps some hundreds of miles away from the nearest public gas supply, or it may even have been due to a collection of sewer gas. The worst of an idle rumour is that it is not idle long, and in this direction it must be borne in mind that many persons merely scan the headlines until a more suitable opportunity arrives for reading the letterpress, by which time the wrong opinion has been formed, and the damage done.

We all know that it *is* possible to put things in their proper light in the local Press, but with the daily Press it is not quite such an easy task. How, then, can the position be altered? I think it can only be done by one of the national bodies connected with the industry *really* taking the subject in hand, by means best known to persons much more capable than myself. We have, I am proud to think, a flying start in the knowledge that the Press are, as I have already said, anxious to give useful, but truthful, information, and above all they have that love of fair play which is inborn in the average Englishman. I will leave the matter at that, and if the position of affairs can be altered by my having mentioned it to-day, I shall be well repaid.

Work of the Association: District Meetings.

No doubt we have all read the Association reports for the past year, and if you will allow me I should particularly like to refer to that of the Committee of the Eastern District. I do so because I feel that many members of that district are not availing themselves fully of all the good fare which is being provided. These monthly meetings were started before the formation of the national bodies, and were called primarily for the discussion of commercial matters and other affairs, most of which are now dealt with by the National Gas Council, British Commercial Gas Association, and Federation of Gas Employers. For some years past, in addition to the consideration given to such matters as markets, some technical subject has been brought forward for discussion. In my opinion, and I think in that of most persons who attend, a fund of information is thus made available which it is impossible to obtain at any other type of meeting, where discussions have to be carried on somewhat on the lines of a debate. The value of the district meetings lies in the fact that a very full and frank exchange of views takes place, and I can assure those who have not yet made it their pleasure to attend that they have missed much.

It was my good fortune to preside over those meetings last year, and with the consent of the present Chairman (Mr. A. W. Sumner) I am going to suggest that the members of the Eastern District should endeavour to emulate their colleagues in the West, where the percentage of attendances is extraordinarily high, especially when it is borne in mind that the difficulties of travelling are somewhat great. Please do not misunderstand my suggestion. It is not merely record attendances we are desirous of establishing; it is rather because we are positive that great good can be done to, and knowledge gained by, all who care to avail themselves of the opportunity, that I make the appeal.

Conclusion.

Gentlemen, I now come to the end of my remarks, and thankful though you must be, I can assure you I am even more grateful for the patient manner in which you have listened to me. I fully appreciate that my Address has not been an inspiring one, such as you have heard on many previous occasions; but if I have said something which may have caused any member to ponder as to whether he and his undertaking are doing all they can to maintain—aye, even add to—the prestige of the industry, not only in his particular neighbourhood, but throughout the country, I shall be well satisfied. We, as members of this Association, have, in the various positions we occupy, assumed enormous responsibilities in regard to the service we have to provide to all gas consumers within our areas of supply; and if those duties are carried out efficiently, the public will the sooner realize, as we do, that of all industries within the Empire the gas industry is one of the greatest, if not *the* greatest, upon which the health and happiness of the population depend.

Lastly, I am proud to think that ever since the inception of this Association there has been a keen desire to assist one another in whatever difficulty may arise, and I trust it will ever be so. I therefore make no apology for concluding by reminding you of the following quotation, which is rendered none the less sincere and beautiful by constant repetition: "I expect to pass through this world but once. If there is any good thing which I can do, or any kindness I can show my fellow man, let me do it now. Let me not defer or neglect it, for I shall not pass this way again."

BRITISH COMMERCIAL GAS ASSOCIATION.

Visit to the Works of Electrolux, Ltd., at Luton.—The Refrigeration Load.

On March 26, members of the British Commercial Gas Association, accompanied by the Chairman of the Executive, Mr. F. W. Goodenough, C.B.E., visited the Luton Works of Electrolux, Ltd., to inspect the manufacture of the "Electrolux" refrigerator, which, operated by gas, is a highly efficient appliance, and constitutes an effective medium for gas publicity and gas sales. The whole question of gas for refrigeration was dealt with in an article in the "Journal" for Jan. 11, p. 90, in which it was stated that "for well over a century gas has served the public faithfully and humbly. Its services have been so well performed that the public now take them as a matter of course. How often does the man in the street think about gas? Normally, perhaps, four times a year—when he gets his bills. He gives no thought to the extraordinary (and, it can be truly said, romantic) variety of purposes for which gas is used—from the ripening of bananas and the manufacture of buttons to the heating of furnaces and the lighting of cities. On the other hand, his imagination is constantly being stirred by electricity, which can be used to actuate Robots, and so on. How excellent, therefore, at the present juncture to broadcast the information that gas heat is the simplest and most economical agent for refrigeration purposes—the 'flame that freezes!' When throughout the country interest is being taken in the subject, what good publicity could be given to gas by having window displays demonstrating the use of gas for freezing, and an intensive Press publicity campaign."

It was with this in mind that the visit on March 26 was made to the works of Electrolux, Ltd., which commenced operations on May 19 of last year. The visitors were able to inspect all the stages of the manufacture of "Electrolux" refrigerators, from the stamping of the steel to the testing of the finished product; and there was general approbation of the efficient methods adopted by the firm.

How the "Electrolux" is Made.

In the first place, all the raw material—which, by the way, is purchased in this country—is brought to the works by road transport from the rail-head at Luton, and is deposited in the stores. This raw material consists of angle iron for frameworks, high-grade "Armco" sheet iron for linings, cork for insulation, and substances for manufacturing the porcelain. Then there are various components such as screws, Monel metal strips, door furniture, shelves, rubber beading, hooks, ice-trays, stop-cocks, heating elements, cold regulators and radiators, and marble slabs.

The first process of manufacture is the cutting to sizes of angle-iron for the framework of the steel cabinets. After being cut, the angle iron is punched with the necessary screw holes, and is then taken to the welding department, where, in special jigs, it is welded into complete frameworks and is finally transported to the assembling shop. Simultaneously, the refrigerator linings are sheared from sheets of "Armco" iron, are pressed to form in the pressing shop, and finally welded to form complete "boxes" in the welding department. These "boxes" are then taken to the pickling room, where, with the aid of the latest labour-saving devices, they are manipulated in the various baths which prepare them for the pure porcelain coating which they are later to receive.

From the pickling shop the "boxes" go to a point where they are thoroughly inspected before being transported, by conveyor, to receive three separate and distinct coatings of pure porcelain material. The first coating involves "slushing" the "boxes" in a bath of blue-coloured porcelain material, and subsequent transference, still by conveyor, through a drying chamber and into a furnace. Hydraulic forks thrust the "boxes" into the furnace, where they remain for a period of three to four minutes at a temperature of 1500° Fahr.—a heat which causes the coating received in the "slushing" to fuse into pure porcelain.

Emerging from this furnace, the "boxes" are transferred to a spraying platform, where they receive a first coat of white porcelain compound. They are then inserted again in the furnace for a similar period to the first. Next follows a second spray coating of white porcelain and a third entry into the furnace. When cooling has taken place, the refrigerator linings are complete with a perfect covering of pure white porcelain, which is integral with the iron foundation itself, and not at

all in the nature of a "coating" in the ordinary sense of the word.

The frameworks and linings are now complete, and ready to pass to the assembly shop. Into this shop also come the steel sheets, sheared to shape, for the outer walls of the cabinets. Cork for insulation of the walls and doors reaches here from the stores, as also do other components such as hinges, handles, shelves, hooks, &c. With regard to the cork, this important material, before being built into the cabinets, is first soaked in hydrolene, a chemical which kills all insect pests which might lurk in the cork and afterwards cause damage by their voracity. The hydrolene, moreover, secures the cork against attack by insects which might enter it subsequently, as in the case of cabinets installed in tropical countries. It is expensive to treat the cork in this way, but the results obtained, we were informed, fully warrant the outlay.

In the assembly department a sufficient supply of components for a full day's work arrives from the stores, and from the unit testing department come a sufficient number of units for installation in the cabinets. In the manufacture of actual units, the steel tubes and cylinders are drawn from stores, and welded together in a special department. When completed, they are filled with air at high pressure, and tested under soapy-water; the slightest leak being apparent. Once proved to be perfectly sound, the unit at this stage is taken to the filling room, where it is charged with ammonia and hydrogen—a process which is conducted under expert supervision. On special benches the units are then exhaustively tested for cooling and frost-producing capacity, after which they are mounted on their respective control boards and dispatched to the assembly department for installation in the cabinets. Even now, however, the tests are not complete as, in the form of a complete cabinet, every "Electrolux" refrigerator is again thoroughly tested before being finally passed as satisfactory for delivery.

Following the tour of inspection, those present were entertained at luncheon.

Mr. B. DAHLERUS, the Managing Director of Electrolux, Ltd., on behalf of the firm, welcomed those present. He remarked that it was two years since he first met the Chairman of the "B.C.G.A." and told him that he (the speaker) had a wonderful refrigerator which was operating successfully on gas. The intervening time had been spent on development; and the firm were most grateful for the support of Mr. Goodenough and the British Commercial Gas Association, who had helped unobtrusively in many directions to perfect a refrigerator which could be operated most economically and satisfactorily by gas.

GREAT FUTURE FOR REFRIGERATION BY GAS.

Mr. GOODENOUGH, having expressed the thanks of the Association for the welcome which had been extended, said they had been most interested in their inspection of the works. Because of the new food regulations which would come into force next July, refrigeration would be essential, and the gas industry were glad to think that in this matter they could play a leading part. There were, of course, electrically operated refrigerators, but he believed that the machine worked by gas, which had been brought—he would not say to perfection, because there was no such thing—to a high degree of perfection, offered a new field of business for the industry and had a great future before it. They did not contemplate an enormous consumption of gas by this means, but they were keen to demonstrate to the public that, as new requirements of the community arose, gas could meet those requirements efficiently. Though the consumption which might accrue was not to be despised, particularly as the load would be mainly in the summer, the main point was that refrigeration constituted a new use for gas in the home, in the restaurant, and in business. Thus they welcomed the introduction of the "Electrolux," though he could not say they were enamoured of the name. This question had been raised with the makers, who, he was assured, would do all they could—short of changing the name, to which goodwill attached—to make it clear to the public that the machine was operated by gas. Doubtless, continued Mr. Goodenough, members of the Association would like to raise points regarding the working of the refrigerator, and so on; and for this purpose it was proposed to hold at once a "B.C.G.A." meeting on the subject. Then, after discussion, if they felt satisfied with the gas-operated "Electrolux," they could determine whether they should co-operate with the makers in giving it the necessary publicity. The question had been dealt with well and precisely in an article in the "GAS JOURNAL" for Jan. 11 last, p. 90; and in view of this, he did not propose to traverse the ground again. In concluding his remarks, Mr. Goodenough emphasized that they of the "B.C.G.A." were not in the least wedded to the "Electrolux," and that if other gas-operated refrigerating appliances came along they would be considered. At present, however, the "Electrolux," appeared to be the most efficient gas-operated machine, and members of the Association had certainly appreciated the opportunity of seeing with what care and skill its manufacture was carried out.

REFRIGERATORS NECESSITIES, NOT LUXURIES.

Mr. DAHLERUS observed that the question of refrigeration had not yet been brought home to the public in this country. To preserve food properly, it was essential to keep it in an atmosphere the temperature of which was not above 50° Fahr.; and it was impossible to do this without resort to a refrigerating unit. The temperature of 50° Fahr. could be considered a danger point, for above this bacteria continued to live. To obtain the full benefits of refrigeration, however, it was necessary to go far below 50° Fahr., for, to kill some bacteria, a temperature approaching, or even below, zero was needed. At present the public regarded a refrigerator as a luxury. Actually, however, it was a necessity; and collaboration between the gas industry and the makers was required to bring this fact before the public. The smaller the home, the greater was the need for a refrigerator; and his firm were about to put on the market a small and cheap unit, which could be worked by gas, and which they would be prepared to sell on the instalment system. It could be taken that the cost of gas was one-third that of electricity for operating the refrigerator.

Mr. GOODENOUGH inquired whether any charge would be made for the water used for working the refrigerator.

Mr. DAHLERUS replied that the Metropolitan Water Board had passed a ruling to the effect that no extra charge would be made for water used for domestic purposes. An additional charge might be made in a few places; but he would mention that the water used in the unit need not be wasted. It could be collected, and employed for any purpose.

Mr. S. B. CHANDLER (Tottenham District Light, Heat, and Power Company) asked whether the firm had any scheme of maintenance, and what would be the cost of such a system.

Mr. DAHLERUS said that his Company had established forty-two district offices, in connection with each of which was a service staff well trained in the use of refrigerators. After a unit had been sold and installed, the man responsible for the sale called on the consumer and explained how the appliance should be used. A further call was made in another fortnight, and then visits were paid quarterly. In this matter their endeavour was to establish close co-operation between themselves and the gas undertakings, to ensure that the service rendered would be satisfactory. The "Electrolux" was sold under a year's guarantee, but after this period a small charge was made for anything which needed doing.

Mr. GOODENOUGH observed that it was most important that people should be instructed in the use of refrigerators, for complaints were for the most part the result of ignorance, and not of the improper working of the appliance. If common-sense was exercised, difficulties would generally disappear. In his own experience, no maintenance was needed, provided attention was paid to proper ventilation, because the machine had no working parts.

Mr. B. J. BELL (Cardiff) mentioned that Electrolux, Ltd., charged gas undertakings for their window display—"The Flame that Freezes"—which appeared to him strange when the firm were enjoying the benefit of the publicity. Another point was that the prices for the refrigerators were quoted carriage forward. Bearing in mind the cost of a refrigerator, which was no small item, he thought freightage should be included. With regard to this new business, the traders dealing with perishable goods were the first to tackle. Had anything been done in this matter by way of circulars, &c., on which the name of the local gas undertaking could be printed?

Mr. DAHLERUS remarked that during the period May 5 to 21, when it was intended to launch a refrigeration campaign, a small charge would be made for window displays only when the name "Electrolux" was not included. If the name was displayed, then there would be no charge. Their prices were quoted carriage forward because it was their aim to sell the refrigerators as cheaply as possible, and it was unfair that the customer situated near the works should help to bear the cost of carriage of an appliance supplied to another customer who lived far away. With regard to circular letters, their Technical Manager, Mr. G. Berg, would be pleased to collaborate with the gas undertakings. Retailers of perishable foodstuffs would have to instal refrigerators; and joint propaganda would help to bring this fact home to them. Electrolux, Ltd., would be prepared to supply blocks, and pamphlets on which the name of the gas undertaking could be printed.

Mr. N. S. SMITH (Luton Gas Company) asked whether Electrolux, Ltd., were aware that the present position of the flue outlet of the new model resulted in discoloration of the end part, and whether they were taking steps to alter this. The cost ratio of 1:3 for gas and electricity, he remarked, did not apply to all districts. In Luton, for example, the ratio was nearer 1:1. Regarding the "Electrolux" machine, he had two years' experience of it; and it could be taken that the gas burner was now practically perfect.

Mr. GOODENOUGH, who said that the ratio 1:3 in favour of gas could be regarded as the average for the country, asked Mr. Smith what were the charges for gas and electricity in Luton.

Mr. SMITH replied that gas was sold at 8¾d. per therm, and that electricity was supplied at a flat rate of ½d. a unit.

Mr. DAHLERUS assured Mr. Smith that the question of the flue outlet was receiving attention. With regard to terms, the firm supplied a demonstration model free against four orders.

Mr. BELL asked what was the period of hire-purchase.

Mr. DAHLERUS replied that it was under eighteen months.

Mr. CHANDLER inquired whether Electrolux, Ltd., preferred to negotiate this hire-purchase business themselves.

Mr. DAHLERUS replied that it could be carried out either by the firm or by the gas undertakings.

This terminated the discussion; and thereafter some of the members availed themselves of the invitation which had been extended by the Chairman and Directors of the Luton Gas Company, to visit the Company's showrooms, where they were met by Mr. W. Phillips, the Engineer, Manager, and Secretary.

The showrooms are centrally situated, and, designed by the Nautilus Fire Company, are extremely well arranged. In common with the experience of many other gas undertakings, since they were brought into operation, the sales of gas, despite keen competition, have advanced in a remarkable manner.

North of England Gas Managers' Association.—The annual general meeting of the Association will be held in Newcastle-upon-Tyne on Friday, May 4, at 2.15—Mr. T. P. Ridley (the President) in the chair. The following papers will be given: "Recovery Methods and the Ammonia Problem," by L. H. Sensicle, B.Sc., F.I.C., of Newcastle; and "Notes on the Design, Maintenance, and Working of Coal and Coke Handling Plants," by Mr. W. L. Robertshaw, of Sunderland.

MR. W. G. S. CRANMER'S PRESIDENTIAL ADDRESS.

Midland Association of Gas Engineers and Managers, March 29.

The position of President of an Association such as ours will probably be approached by the one elected with mixed feelings—on the one hand appreciation of the honour conferred on him by his fellow members, on the other trepidation lest he should fail to uphold the dignity of the office or maintain the high standard set him by his predecessors. That is my position. I thank you for the honour of election to this office, and ask your indulgence if I fail in any respect.

As the structure of the future will be built on the foundation of the past, we naturally refer to that which has been accomplished; we can only speculate on that which is to come; and, in looking backward, we are apt to pause at the year 1914. Most standards prior to that date are now obsolete, and since then progress has been rapid but difficulties numerous.

The war period set us tasks to produce gas with the minimum of labour, with our principal raw material frequently below the average quality to which we were accustomed, and at the same time the additional plant required to meet the heavy increased demand in some cases unobtainable. The usual work of making-good ordinary wear and tear had to be more or less neglected; the succeeding period being over-burdened by such work in the attempt to make up for lost time.

The post-war period has been equally difficult. The great increase in the cost of all plant and material, together with the limitations imposed by the sliding-scale, strained the finances of most companies to the utmost, until relieved by the Gas Regulation Act.

A heavy increased demand during the "boom" period was followed by a bad slump, which in the case of the Company which I represent amounted to 20 p.ct.

Effects of Coal Strikes.

The stoppage of normal coal supplies for lengthy periods in the years 1921 and 1926 again put the industry on its mettle. The difficulties of producing gas with unaccustomed varieties of coal—some of it entirely unsuitable—and of meeting the immensely increased cost were in the majority of cases satisfactorily overcome, and gas undertakings emerged from the ordeal with enhanced reputations. Indeed, it is probable that the industry will benefit from the struggle for some time to come, for during the periods of coal shortage the demand for gas heating and cooking appliances was greater than the supply, and most of the additional apparatus then installed will remain in use. My Company were fortunate in being able to obtain local coal, usually termed outcrop, but actually obtained from shallow workings five to ten yards in depth. Some of the seams were useless. Others had slight coking properties, and when mixed with a good gas coal produced a fair coke. We found it possible to use 50 p.ct. of the local coal with best English gas coal, and 60 p.ct. with American coal; the American making a stronger coke than the English variety. It was not possible to make a working test of the local coal for its gas-making properties, but we appeared to be getting in the neighbourhood of 60 therms per ton out of it.

I am inclined to think that, at such periods as those to which I have just referred, the whole of the increased cost of production should be at once passed on to the gas and coke consumers. The memory of the public is proverbially short, and those who hope for future advantage by a liberal or self-denying policy will probably be disappointed.

The losses sustained during the earlier years of the trade depression have since been considerably more than recouped, but we are now threatened with intensive electrical competition which will necessitate increased vigilance on our part. Developments by our competitors will have to be met by greater efficiency in gas production and appliances, and extension of maintenance services.

The Position of Small Works.

The small country gas-works adversely situated as regards cheap coal supplies, it appears to me, will be most likely to suffer from this competition. Their overhead costs are generally high, their working efficiency frequently leaves much to be desired, and the class of consumer is not conducive to a high average gas consumption. All these factors militate against low charges for gas, and point to the desirability of absorption by larger neighbouring undertakings.

As a set-off to be obtained by such a policy, the value of the plant, with the exception of the gasholders and distributing system, would immediately drop to that of scrap, and there would be the additional capital charges on the necessary high-pressure trunk mains. The coke required in the district absorbed would have to bear the extra cost of the longer distance of haulage, and such extra cost would not in all cases be obtainable from the consumer. These are all factors which would have to be faced; and each proposition for amalgamation or absorption should be very carefully considered on its own particular merits and conditions.

The cost of electrical distribution in rural districts has been considerably reduced by the adoption of overhead lines, and still further efforts are being made by our competitors in this direction. Recently two Members of Parliament, acting on behalf of a committee, reported that, while in this country overhead lines in rural areas cost £600 per mile, similar lines were built in Sweden for £200.

The report emphasizes that the cost of generating electricity is not the principal factor which determines the price the rural consumer has to pay; the most important matter being the need of a cheap method of distribution. Attention is drawn to the desirability of bringing regulations governing distribution more into line with those obtaining abroad.

We too realize that the cost of manufacture is not the only factor which determines the price at which gas can be sold. Distribution costs have been rising steadily for some years, owing to modern traffic conditions necessitating a more expensive type of road surface.

Water-bound macadam is now only to be found in streets carrying little traffic or in country lanes, and most other thoroughfares are constructed in such a manner as to make it expensive and difficult to gain access to our mains and services. In such cases I endeavour to lay a main in the footpath on the opposite side of the road to that on which the existing main is laid. Unfortunately in many instances the footpaths

Fig. 1.—Reconstructing Railway Bridge at Willenhall, showing Ducts carrying Gas Main, Electric Cables, Water Main, and Post Office Cables. There will be similar Ducts under the footpath on the other side of the Bridge.

are already congested with electric and telephone cable conduits, or even Mond gas mains, rendering such a procedure impossible.

The advantages of mains on both sides of the street are obvious. Not only do we avoid long lengths of small service pipes, with their greater liability to stoppage, but the life of a cast-iron main is infinitely greater than the wrought-iron service pipe, and when on the footpath it is removed from the vibratory effect of fast and heavy traffic, which in industrial towns and on main roads is increasing so rapidly.

These changes in distribution methods entail considerable additional capital outlay and consequent charges. Reinstatement costs have also increased both for footpaths and roadways, and the whole constitutes a considerable addition over and above the cost of manufacture.

Again, the density of houses to the acre built by local authorities under the several Housing Acts, as also those built by private individuals, is much less than formerly was the case, the result being fewer consumers per mile of main. In addition, as the gas undertaking has to pay its share of the higher rates and taxes necessitated by the subsidy, the net result is indirectly a further charge on distribution.

Capital Costs Per Therm.

To revert to the question of competition from our electrical friends, we have little to fear as long as we are allowed to

meet them on equal terms. The following is a quotation from a report of the Public Utility Commissioners in the United States on methods of charging for gas.

However this may be, it seems to your Committee that constructive and statesmanlike regulation demands that the Commissioners should aid in every way possible, through encouragement of reasonable and business-like forms of rates, the full development of public utilities in their service to the people. Nothing could put State regulation on a more useful and firmer basis.

That is a statesmanlike pronouncement, and one to be commended to the authorities of this country as the general policy which should be adopted towards all public utility undertakings. They all, of whatever nature, supply a definite public want, and no one class should be selected for either penalizing or assistance.

The price of gas for lighting purposes is by no means the determining factor with a householder as to whether he uses it or not, when an alternative is available; but for other purposes the undertakings which can sell at a low price per therm will be in the most favourable position to meet competition, and capital charges play an important part in arriving at the price at which gas can be sold.

The "Gas World" Analyses of Accounts of Gas Companies for 1926 show a remarkable divergence in this item; the minimum being 0·65d. and the maximum 3·46d. per therm—the prices charged for the gas being 6d. and 1s. per therm respectively. Under these conditions, one would expect to find a considerable difference in the consumption per consumer, and such is the case; the figures being 266 therms against 126. A further study of the analyses shows that a low price per therm synchronizes with a high consumption per consumer and per mile of main. One is tempted to speculate as to whether the large consumption is due to the low price or *vice versa*.

It has always been the policy of the Directors of the Willenhall Gas Company to keep down capital expenditure—to spend nothing on plant or buildings which had no earning value. This is reflected in the capital charges per therm sold—viz., 0·72d. I may say the receipts for gas during the past year averaged 7·27d. per therm.

PRACTICE AT WILLENHALL.

The district supplied by the Willenhall Gas Company is very compact, and essentially industrial, consisting mainly of factories and workmen's houses. There is no considerable number of better-class houses, as many of the manufacturers live outside the district, and the Company has had to depend primarily for its growth on the adoption of gas for numerous manufacturing operations and the encouragement of its use for domestic heating. The population supplied is about 29,000, in rather less than 5800 houses; while we have actually in use 6286 meters, not including discount meters. The excess in number of meters over that of houses is due to the large number fixed in factories.

The consumption per mile of main is high for a small town, being nearly 9 million c.ft. per annum; and though in a portion of the district we have a considerable mining population who get free coal, 64 p.ct. of the private consumers use cookers, and the number is rapidly increasing.

The following diagram indicates the remarkable change in the distribution of the consumption during rather more than thirty years. The upper solid line shows a normal mid-week day and night winter consumption; while the broken line relates to the corresponding summer consumption. Exceptional winter demands owing to fog, &c., or low summer output due to any unusual circumstance, have been disregarded in making the diagram. You will notice there was comparatively little difference between day and night consumptions in either summer or winter in the early nineties; but the day consumption has been gradually growing—especially since the middle of the war period, since when the day load has increased out of all proportion to the night load. In thirty years the summer day load has increased 520 p.ct., the night load 100 p.ct., the winter day load 263 p.ct., and the winter night load approximately 100 p.ct.

The use of gas fires or other heating apparatus is encouraged by a liberal concession in the charge for gas consumed; the rates being the same as those charged for manufacturing purposes. For arriving at the rate to be charged, the quantity used in a factory for manufacturing and/or heating is added to the quantity used for heating in the private houses of any members of the firm who may be living in the town. This policy has given great satisfaction to our consumers, and has at the same time been of considerable benefit to the Company.

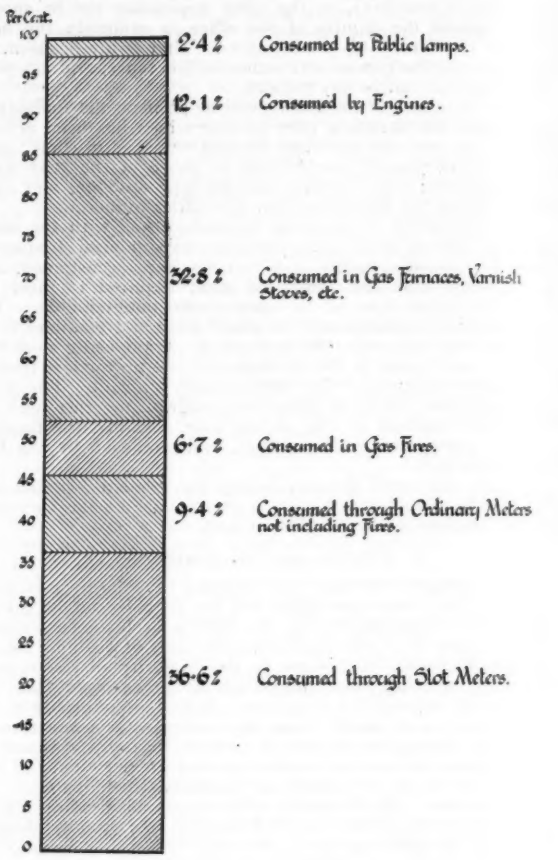


Fig. 2.—Showing Percentage Sales.

SCIENTIFIC METHODS OF CHARGE.

During the past year or two the question of scientific methods of charging for gas has been prominently before the industry.

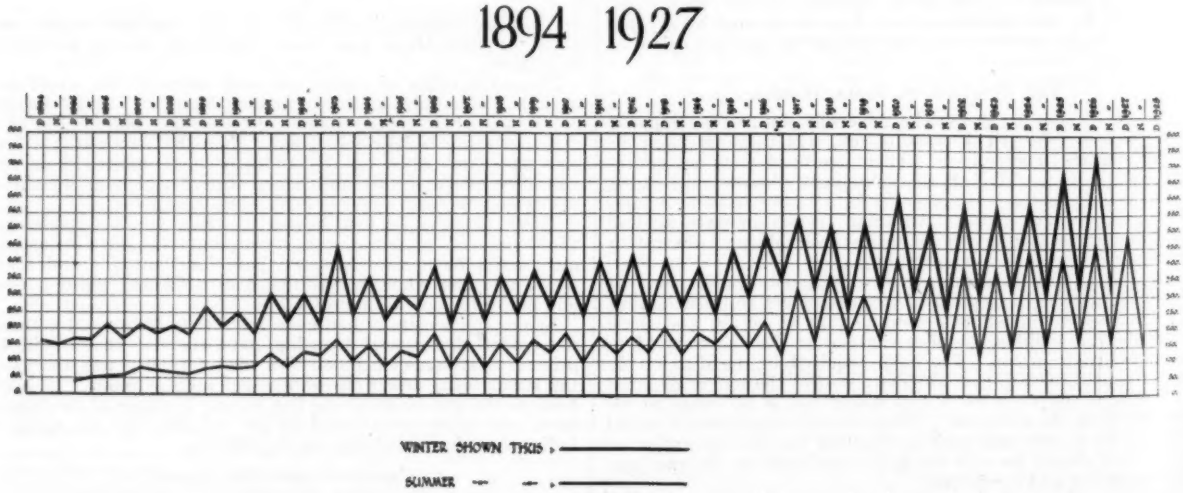


Fig 3.

In the "GAS JOURNAL" of Jan. 11 this year, the Editor, commenting on a decree of the United States Court for the Western District of New York legalizing the principle of a proper allocation of costs in arriving at gas consumers' rates, says:

The decision, we believe, will break-down what has been the main obstacle to a wider adoption than has already been the case in the United States of a tariff which has justice and common-sense to support it, and is an inducement to the greater beneficial use of the gas service.

From an equitable point of view, the various proposals are commendable; but I am not satisfied it is desirable to introduce methods of charging which cannot be easily understood by the consumers. A carefully calculated sliding-scale, it appears to me, meets the case. A consumer readily understands a system whereby he pays less per 1000 c.ft. or per therm, the more he consumes. No scientific method of charging can be perfect, and any method may conceivably be expensive to carry out, as it will probably entail additional clerical work. Before any new system is adopted, there should be clear evidence that a revolution in charging methods will bring increased business.

The public appears to be wilfully stupid in understanding new methods. Take, for instance, the change from units of 1000 c.ft. to the therm. What could be more simple to the man or woman willing to understand? It will be remembered how at least one newspaper pandered to that class of people who will not understand.

The Willenhall Gas Company was one of the earliest to obtain an Order under the Gas Regulation Act. At first the gas consumption was shown in cubic feet, in equivalent therms, and calculated at the appropriate rate per therm, but it was speedily found advisable to revert to the older method. The price per thousand cubic feet being given on the account in full pennies, the fractions were reserved for the equivalent price per therm, which is also shown on the account, to fulfil our statutory obligations.

As early as the year 1844 the Directors of the Willenhall Gas Company realized the advantage of a sliding-scale of prices as shown below.

Charges for Gas at Willenhall.

		s.	d.
1837	Per 1000 c.ft.	10	0
1844	Less than 5000 c.ft. per quarter	9	2
	Exceeding 5000 and less than 15,000 c.ft.	8	4
	Exceeding 15,000 c.ft.	7	6

In later years the consumption scale was altered, but differential prices were adhered to.

	s.	d.		s.	d.		s.	d.
1851	6	8	..	6	4	..	6	0
1860	4	6	..	4	3	..	4	0
1864	4	2	..	3	10	..	3	6
1868	4	0	..	3	8	..	3	4
1876	3	9	..	3	6	..	3	3

In the early part of this century the scale was considerably extended with the object of encouraging the use of gas for manufacturing purposes; and in 1914 it stood as follows:

Lighting Scale.

	s.	d.
Less than 50,000 c.ft. per quarter	2	9
Exceeding 50,000 c.ft. and less than 100,000 c.ft.	2	7
,, 100,000 ,, ,, ,, ,, 500,000 c.ft.	2	6
,, 500,000 ,,	2	3

Manufacturing, &c., Scale.

	s.	d.
Less than 50,000 c.ft. per quarter	1	10
Exceeding 50,000 c.ft. and less than 100,000 c.ft.	1	8
,, 100,000 ,, ,, ,, ,, 200,000 c.ft.	1	6
,, 200,000 ,,	1	4

The present scale is, for lighting and cooking, 8·15d. per therm.

Consumed in any description of apparatus employed in manufacturing operations, gas engines, and gas fires (including domestic), when the quantity consumed per quarter is

Less than 250 therms	7·04d. per therm
Exceeding 250 but less than 500 therms.	6·48d. ,,
,, 500 ,, ,, 1000 ,,	5·92d. ,,
,, 1000 ,, ,, 2750 ,,	5·37d. ,,
,, 2750 ,, ,, 3000 ,,	4·81d. ,,
,, 3000 therms	4·44d. ,,

EARLY DAYS.

A little of the history of the Willenhall Gas Company may be interesting. The circular issued by the Directors when the Company was first formed in 1837, which makes entertaining reading, runs as follows:

The Willenhall Gas Company desire to acquaint the Public that having completed their Works for the preparation of Gas on the most modern and approved system; they are enabled to supply Gas of a very superior quality, and on such terms as will with proper management be not only satisfactory but convenient to the consumer.

The introduction of Gas light into manufactories is bound to answer every desired purpose, and if used according to the regulations of the Company, a very superior light can be afforded at the present cost of candles.

It is well known that the light of a Candle which is so brilliant when first snuffed, is very soon reduced to one half. This is not the case with Gas lights, for as soon as the Gas is allowed to issue from the burner and a light being applied it will immediately inflame, and will continue to burn with superior brilliancy, steadyness and safety until the supply is discontinued.

Prices of Gas Lights.

	£	s.	d.	
Single Jett Factory Light	0	0	6	Per Week
Double ditto	0	0	9	ditto
House and Shop Light No. 1 Argand	2	2	0	Per Annum
ditto ditto No. 2 Batswing	2	10	0	ditto
Inn and Public House Lights	3	3	0	ditto

If by measure 10s. per thousand Cubic feet.
Large Consumers or Lights used for irregular periods subject to special agreement.

The "Regulations and Conditions" which followed stated among other things that the accounts for houses, shops, and inns would be collected quarterly, while those for factories would be collected weekly. This was due to the employers stopping sixpence per week from each workman for light.

OPPOSITION.

For twenty years the Company functioned as a private undertaking, not only paying fair dividends, but accumulating a reserve. Then opposition was threatened. Another Company was formed, and the promoters obtained the sanction of the local authority to erect works. I believe a Mr. Flintoft was behind the promoters of the opposition. This gentleman was at that time well known in the gas industry. He travelled the country stirring up trouble among gas consumers and floating opposition companies. I believe these were generally bought up by the proprietors of the existing undertakings, which was probably his object. On the first threat of opposition the old Company applied for and obtained Parliamentary powers, which came into force in June, 1857. Since then the progress of the Company, except in two short periods, has been steady and continuous.

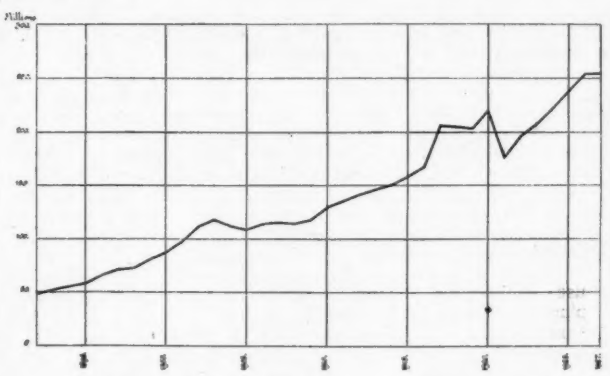


Fig. 4.—Showing Growth of the Undertaking.

The original works were situated in the centre of the town, with no railway accommodation; the site being most unsuitable in every respect. In the year 1890 it became obvious that, if the Company were to carry out their obligations, it would be necessary to find a fresh site and build a new works. The present works were commenced in 1892; the late Mr. William North, at that time Engineer and Manager of the Stourbridge Gas Company, being the Consulting Engineer.

CARBONIZING PLANT.

The first retort house contained a bench of seven arches, each designed to take eight 22 in. by 16 in. by 10 ft. stop-end Ω-section retorts; five arches only being filled in. The retorts were heated by Klönne regenerative settings as modified by the late Mr. R. O. Paterson, of Cheltenham. Instead of the usual hydraulic mains, cast-iron dry mains were installed. The ascension pipes were of unequal lengths, the object being to cause the gas to travel the same distance from each retort to the dry main. Whether there was any definite advantage in this arrangement, I was never able to determine.

To replace the hydraulic seal, a butterfly valve was fixed in the centre of each bridge pipe, but this constituted a continual source of trouble, owing to the accumulation of thick tar or pitch which collected on the valve discs, causing frequent stoppages. In the remodelled house I adopted hydraulic mains and Cort anti-dip valves, giving the advantages of both hydraulic and dry mains without their disadvantages.

An additional retort house was built in 1901 having eight beds of single retorts similar in section to those in the old house. West manual stoking machinery was installed in this house in 1912, and continued in use until 1919, when, owing to the greatly increased cost of labour, it was decided to remodel No. 2 House, and the retort bench was rebuilt to accommodate 20-ft. through retorts. To do this, practically the whole of the lower half of the back wall of the house was removed; the upper portion being supported on R.S.J. stancheons, which were at the same time to act as buckstaves on the discharging side of the bench. A steel-framed annex was built on this side

Fig. 5.—Interior of Retort-House.

to provide shelter, but as much as possible was left open, the result being most satisfactory from the point of view of ventilation.

At the same time "Guest-Gibbons" stoking machinery was installed, together with a telpher for coke handling. Owing to the excessive cost of ironwork at the time the work was being carried out, the existing retort mouthpieces were re-used. Consequently full advantage could not be taken of the stoking machine. Under more favourable conditions, 24 in. by 16 in. or 18 in. retorts would have been adopted. The head-room, too, under the extended portion of the house prevented the telpher track being constructed as high as desirable. Another 5 ft. in height would have increased the coke-stacking capacity by nearly 100 p.ct. The carbonizing plant in No. 1 House was scrapped, as, owing to its situation, it was impossible to instal machinery; and a portion of the building is now occupied by a Davison & Partner carburetted water gas plant having a nominal capacity of 500,000 c.ft. per day.

So far we have had no reason to regret having continued the use of horizontal retorts when reconstructing the carbonizing plant. Our make per bed of retorts each twenty-four hours varies from 115,000 to 125,000 c.ft.; and with an improved charger-head which we hope to have in use shortly, I expect to improve on these figures considerably. As I have mentioned previously, the retorts are small in section for machine stoking, and consequently these results may appear poor compared with those obtained in works using a larger section. But the make in therms per ton will, I think, compare very favourably with any works using horizontal retorts. For the past six months we have exceeded 73 therms. This, compared with the results obtained from vertical retorts, is not remarkable; but as far as I can ascertain, vertical retorts would not give a higher yield of 540 B.Th.U. gas, which is our declared value.

It is not long since a President of this Association said in his address: "As a very satisfied user of horizontal retorts, carbonizing heavy charges of twelve hours' duration, with good stoking machinery and telpher equipment, I have yet to be convinced that vertical retorts are superior, except, of course, in economy of space." These words express my present opinion. There may come a time when I shall do as the writer of them has done—change it. He is now fully equipped with verticals.

Other Equipment.

The carburetted water gas plant is only used for the peak load in winter and emergencies. We have two gasholders, of 370,000 and 430,000 c.ft. capacity respectively. Having no relief holder, we use the smaller of the two for this purpose when working the plant, leaving an effective storage of 430,000 c.ft. for mixed gas. As our maximum day's output approaches 1,250,000 c.ft., and nearly 800,000 c.ft. of this is taken between the hours of 6 a.m. and 6 p.m., I think you will agree with me that the position as regards storage accommodation is by no means satisfactory. There is no margin to allow for the slightest hitch in the process of manufacture during the heaviest period of winter demand, and being confined to one holder for the mixed gas is not conducive to a straight line on the calorimeter chart, and necessitates constant watchfulness.

By utilizing a holder of comparatively large capacity instead of the usual small relief holder, we have the advantage of making the mixture of coal gas and carburetted water gas fairly uniform over the twenty-four hours, and, what is also very important, of equalizing the work on the purifying plant.

The carburetted water gas is passed through a rotary meter to the inlet of the exhausters, where it mixes with the coal gas and passes with it through the remainder of the works plant.

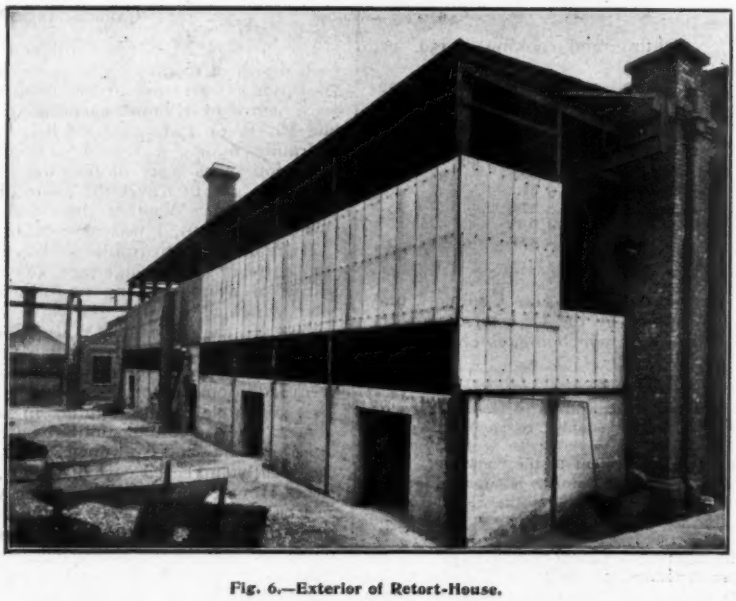


Fig. 6.—Exterior of Retort-House.

When the rotary meter was first used, the flow of gas was regulated by the valve on the inlet; and we were somewhat mystified to find it was registering 20 to 30 p.ct. fast. Eventually it was discovered that this was due to the pulsations of the exhauster. By regulating the flow by means of the outlet valve, keeping the inlet valve wide open, the registration was satisfactory. Nearly all the remaining plant at the works has been brought up to present requirements, and, with the exception of the purifiers, calls for no note.

The original purifiers, which are 20 ft. square, were bought second-hand, and even at that time had been in use over thirty years. As in the year 1924 they were showing signs of old age, and were also too small, my Directors decided to replace two of them with new ones 30 ft. square by 6 ft. deep with rubber jointed covers, as the first instalment of a complete set.

The site selected consisted of an ash tip together with material removed from excavations in other parts of the works. After careful examination I decided to build the boxes in a reinforced concrete tank; and in spite of the unsatisfactory nature of the foundation, there has been no trace of settlement. As the purifiers were to be built in the open, without the slightest protection (the works are particularly exposed and bleak), I sunk the boxes to within 9 in. of the top. This resulted in a comparatively even temperature being maintained.

In my opinion, water-luted covers for purifiers have one great advantage over the dry jointed type. Owing to the absence of deck plates, they are easier to empty, especially when the oxide has caked, and picks are required to loosen it. To overcome this disadvantage to some extent, I decided to have two covers only to each box, and reduce the width of the deck plates as far as possible. The covers are consequently rather large, and have to be handled with care.

It was not without serious consideration that the figure of 540 B.Th.U. was declared when we obtained our Order under the Gas Regulation Act. We are no doubt in the minority in supplying gas of such comparatively high quality, but there appears to be a general tendency in the industry to increase the quality to the neighbourhood of 500, and, for use in burners for ordinary incandescent lighting, I am inclined to think that is a more suitable figure than the higher one, and may in course of time be standardized.

The latest issue of the "Gas World" Directory gives 328 undertakings in Great Britain and Ireland as supplying gas of 500 B.Th.U. and over. Though many of them are small, yet 102 make more than 100 millions; the annual aggregate make of the 102 being 144,383 millions.

On reference to the returns of the National Gas Council, it appears that 36 of the undertakings now supplying gas at 500 formerly declared at a lower figure. Since the Gas Regulation Act came into force, while 24 undertakings have reduced, 71 have increased their declared calorific value. It is interesting that the cheapest gas in the country is sold by undertakings supplying gas of 475, 480, and 500 C.V. respectively, as shown below.

Calorific Value.	Price per Therm to Consumers with Ordinary Meters.	
	Maximum.	Minimum.
	d.	d.
475	6·3	3·16
480	5·5	5·5
500	7·0	3·2

I think most, if not all, of us realize that it is to our ultimate advantage to assist consumers to obtain the highest duty out of the gas we supply. If we can show how the same amount of work can be produced with a smaller quantity of gas, though it may mean an immediate reduction in consumption, an extension of its use in the future for other purposes may be looked for with confidence.

Inspection of Appliances.

With this object in view, we at Willenhall have recently adopted a system of periodic inspection of all gas-consuming appliances in factories. The following is a census of apparatus in use:

Gas engines	51	Horse-power	1027
Gas furnaces—			
Annealing			27
Drop forging			11
Tool (open)			8
,, (muffles)			8
Tempering			2
Varnish and japanning stoves			87
Lacquering tables			36
Plating apparatus—			
Vats			51
Drying barrels			5
,, pans			12
Water heaters for vats			12
Tinning and lead-melting pots			32
Core stoves			14
Brazing hearths			7
Metal cutter			1
			313

There are few, if any, of us who have not had experience of the low-quality incandescent burners obtainable at small shops. Such burners are most inefficient, especially with a gas over 500 C.V. We have frequently had complaints of unsatisfactory lights which, when investigated, were found to be due to this class of burner.

They are usually bought by the poorest consumers; and to counteract this we offer all prepayment meter consumers a good-quality incandescent burner, fixed at cost price, taking payment by retaining the necessary amount from the discount or rebate to which they are entitled, in lieu of altering the price changing device of the meters. This arrangement has given great satisfaction to the consumers concerned.

Fifty Years' Active Service.

We have recently celebrated the Jubilee of this Association. The completion of fifty years' active service is an event which should not be passed over lightly, in the case either of an individual or of an association. It is an occasion for stock-taking, looking backward on what has been accomplished, and looking forward to what may be possible of accomplishment.

In looking backward, the first thing which strikes those of us who have been connected with the Association for any length of time is the change in the personality. The year in which I was elected the membership numbered ninety-five. Sixteen only of them are now members, most of the others have passed over to the "Great Majority"—among them several men of outstanding ability, men who have left their mark on the industry, such as John West, R. O. Paterson, George Winstanley, and Fletcher Stevenson. And I cannot pass on without a reference to my old Chief, William North, so well known for his geniality and sound business qualities.

Perhaps the greatest personality in the life of the Association is Mr. Charles Hunt, who at the moment of writing is still a Member, though no longer able to take an active part in our proceedings. Mr. Hunt, as you know, was the founder of the Association, and the first President—a position he again occupied in 1902, when, as he stated in his Presidential Address, it enabled him "to round off as he began the first quarter of a century of the existence of this Association."

With new men we have new methods. Thirty years ago incandescent lighting was in little more than an experimental stage, and vertical retorts had not become a practical proposition.

Still looking backward, can we say the Association has justified its existence? I think you will all agree with me when I say emphatically, Yes.

There was a time when visitors were not welcome at gas-works. This changed many years ago; and now we are glad to see visitors, especially professional brethren with whom we can discuss our problems or difficulties. Our Association meetings offer greater facilities in this direction, but there is usually a difficulty in obtaining papers. Without them it is not an easy matter to get satisfactory discussions; and I do not consider a paper to have been a success unless it has provoked a good discussion. To that end it should be short, and to the point. If you have an idea different from generally accepted practice, or have adopted some process or appliance not in common use, let us know about it. It will be criticized, but not unkindly. If you have done a little experimenting, no matter how slight, write a few notes on it, and inform our Secretary. A short paper taking a quarter-of-an-hour to read may bring about a discussion occupying an hour, and you will add to your knowledge.

These remarks are really intended for the managers of the smaller undertakings, and more especially for the younger men in the industry, who, generally speaking, have more time to spare for such work. The seniors frequently have to take their share of public or other outside work, which absorbs much of the time not occupied by ordinary duties. The young man who is interested in his work is usually full of enthusiasm, and if he is worth his salt has ideas of his own which he will be anxious to put into practice.

An engineer of a large undertaking in the Midlands who passed away some years ago is reported to have said he did not believe it possible to obtain more than 10,000 c.ft. of gas out of any coal, and it is not so many years since 11,000 c.ft. was considered good working. Much progress has since been made. Have we reached the limit? I do not think so; and though the selling side becomes of more importance as the years pass, yet it is still true that dividends are made in the retort house.

Institution of Engineering Inspection.—A meeting of the Institution will take place at the Royal Society of Arts, Adelphi, on Friday, April 13, when a paper will be read on "Low-Temperature Carbonization."

North British Association of Gas Managers.—The spring meeting of the Association will be held on Friday, April 13, in Edinburgh. Following luncheon at the L. and N.E. Railway Hotel, Waverley Station, the President, Mr. H. H. Gracie, will deliver an Address, and Mr. R. S. Simpson, of Denny, will read a paper on "Lands Valuation and Income-Tax Charges." During the morning there will be opportunity of visiting the Granton Gas-Works of the Edinburgh Corporation.

CONTINUOUS VERTICAL RETORT PRACTICE AT OLDBURY.

By JOSEPH POULSON, F.C.S., Engineer and General Manager to the Gas Department of the Urban District Council of Oldbury.

[Before the Midland Association of Gas Engineers and Managers, March 29, 1928.]

The inauguration of the installation of vertical retorts on the Glover-West system of continuous carbonization at the Oldbury Gas-Works in March, 1925, aroused considerable interest in the gas industry, particularly in the Midland district. In the first place, the plant itself marked an important advance in the design of this well-known type of vertical retort, the success of which in conjunction with that of its principal competitor has done so much to maintain Britain's position as leader in methods of gas manufacture throughout the world.

In the second place, the results obtained for the short period preceding the inauguration gave rise to the questions, Could these results be maintained over long periods and after the retorts had been in operation for a considerable time, and how would they vary with the nature of the coals carbonized?

The importance of accurate knowledge with regard to the results of the carbonization of the different coals obtained from sources in sufficient proximity to the gas-works to be of commercial interest is, of course, universally admitted, and the writer found that the plant at his disposal rendered it possible to carry out a series of tests upon most of the principal coals within his reach without interfering with his normal operations.

Carbonizing results have been given in many excellent papers published by members of the gas profession, and no great deviation from recognized methods has been possible or desirable; but in the present instance the author has endeavoured to follow the routine and the methods employed by the Fuel Research Board of the Department of Scientific and Industrial Research, particularly on the lines of the Report for the years 1920-1921 (First Section: Steaming in Vertical Retorts). The results, therefore, will be comparable with those published by the Board, with the important exception that, whereas those tests were carried out under research conditions, these have been carried out on a commercial basis—that is to say, they are records of observations taken during the ordinary everyday process of making gas as demanded by the district.

The Oldbury gas undertaking and the carbonizing plant were described in detail in the brochure issued in March, 1925. The following brief description of the undertaking and its works as they stand to-day, modified to correspond with developments since that date, is extracted from the brochure.

> Oldbury was originally supplied with gas from the Swan Village Works of the Birmingham Corporation, who previously bought up the Birmingham and Staffordshire Gas Light Company and also the Birmingham Gas Company in 1875. Owing to the opposition taken up by the West Bromwich Improvement Commissioners, and the Smethwick, Oldbury, and Tipton Local Boards, a clause was inserted in the Birmingham Gas Bill enabling the above-mentioned authorities to purchase the right to erect gas-works and supply gas to the consumers. The opposition costs were heavy, and were divided *pro rata* among the seceding authorities. The Oldbury Gas Act was duly passed, and received the Royal Assent in 1876; and shortly after the Local Board of Health, under the chairmanship of Mr. Benjamin Thomas Sadler, commenced building their own works from plans prepared by Mr. A. Upward, of London.
>
> The works were laid down for an output of 40 millions per annum, and were opened on Saturday, Dec. 31, 1881.
>
> During the first two years many alterations and extensions were carried out by the Engineer, Mr. F. J. North, notably the rebuilding of the whole of the retort benches and the telescoping of both holders. Mr. North left Oldbury in 1885 for Para, and was succeeded by Mr. C. Meiklejohn, who, in August, 1892, was appointed to the Rugby management in place of Mr. P. Simpson. The management was then held by Mr. A. Cooke, until his decease in October, 1914; and from that date by Mr. C. H. Carder, who filled the position until March, 1924, when he accepted a position as Chief Engineer at Rio de Janeiro. The writer then became Engineer and General Manager of the gas undertaking.

The graph, fig. 1, shows the growth of the undertaking from 1882 to last year, the exact figures for the last three years being:

Year ended March 31, 1925	210,186,000 c.ft.
" " " , 1926	234,897,000 "
" " " , 1927	257,091,000 "

Since 1912 the works has undergone considerable development and extension. The gas-making plant then consisted of horizontal retorts and carburetted water gas plant. The horizontal retorts have been out of operation since the installation of vertical retorts, and they will shortly be completely dismantled. The carburetted water gas plant comprises a Merryfield-Westcott-Pearson plant of a daily capacity of 340,000 c.ft., and a Humphreys & Glasgow plant, erected in 1915-16, of a capacity of 250,000 c.ft. per diem.

The whole of the gas at the present time is being manufactured in the Glover-West vertical retorts which were put into operation in June, 1923. The auxiliary plant consists of annular condensers of 1½ million c.ft. daily capacity; belt-driven exhausters, one of 50,000 c.ft. and one of 30,000 c.ft. hourly capacity; a Livesey washer of a daily capacity of 1½ million c.ft. installed by Messrs. C. & W. Walker in December, 1924; a sulphur-cyanide washer and Holmes brush washer of 1½ million c.ft. daily capacity; five purifier boxes, each 25 ft. by 25 ft. by 5 ft., for use with oxide of iron; a station meter of 50,000 c.ft. hourly capacity; one 20-in. and one 10-in. district governor.

There are three gasholders of a total capacity of 840,000 c.ft. The works is well equipped with a laboratory and scientific apparatus for testing and chemical control, and the offices are fully equipped with modern machines for dealing with office work.

The total length of mains in the district is 38 miles. The undertaking now serves 2093 ordinary consumers and 5471 slot consumers, or a total of 7564; and since April 1, 1924, 1595 new consumers have been supplied with gas. The works has now a Wilton tar dehydration plant capable of dealing with 2400 gallons of tar per day. There is also a compact showroom at the works for demonstrating various gas cookers, fires, and fittings at work.

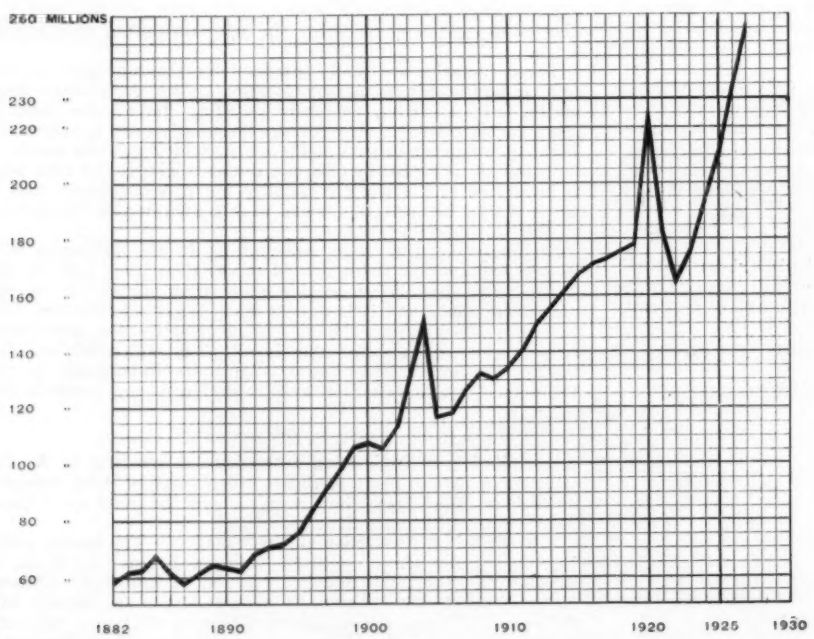


FIG. 1.—DIAGRAM SHOWING GROWTH IN ANNUAL OUTPUT OF GAS IN MILLIONS OF CUBIC FEET.

Fig. 2.—Vertical Section of Retort.

Since the publication of the brochure a new horizontal Spencer-Bonecourt waste-heat boiler of the same type and capacity as the original one has been installed. This is described in the succeeding pages of the paper.

A new exhausting plant (duplicate sets of 50,000 c.ft. per hour—Messrs. Geo. Waller & Co., Ltd., Stroud) is now being installed. A general scheme of reconstruction of works is also in progress.

A Special Order (Oldbury Gas Order, 1927) was applied for and granted by the Board of Trade under section 10 of the Gas Regulation Act, 1920; and the requirements of the gas undertaking in this direction are incorporated therein.

Programme.

The coals tested were those, as suggested above, which had a commercial interest for the undertaking. No attempt was made to test coals which would not be purchased in the ordinary way. The programme of the tests was as follows:

(*a*) The carbonization of North Staffordshire coals for the production of gas of 450 B.Th.U. gross per c.ft.
(*b*) The carbonization of Derbyshire coals for the production of gas of 450 B.Th.U. gross.
(*c*) The carbonization of Yorkshire coals, for the production of gas of 450 and 475 B.Th.U. gross per c.ft.
(*d*) The carbonization of a mixture of North Staffordshire, Derbyshire, and Yorkshire coals, with North Wales slack, for the production of gas of 460 B.Th.U. per c.ft.
(*e*) The continuous testing of operation of a Spencer Bonecourt horizontal waste-heat boiler, during the period of the test.

The various coals were passed through the plant under ordinary conditions and works routine. Each sample of coal was elevated to the bunkers and followed the preceding sample through the retorts. Scurfing of retorts, cleaning of flues, and all other routine work was carried on as usual.

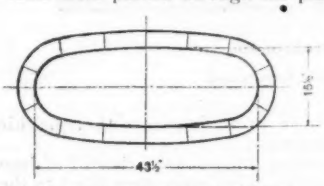


Fig. 3.—Section through Retort.

Carbonizing Plant.

The carbonizing plant consists of sixteen Glover-West vertical retorts, arranged in four groups of four retorts, each supplied with fuel gas from a common producer. The retorts are placed in two lines within the settings, so that two retorts constitute a carbonizing unit with a nominal carbonizing capacity of 9 tons per diem. Each retort, however, can be separately scurfed and otherwise controlled, and is for all other purposes a distinct unit.

The retort is of the now well-known Glover-West "New Model." It is elliptical in section, tapering from 40 in. by 10 in. at the top to 46 in. by 18⅓ in. at a point about 21 ft. below, where it rests upon the "steaming chamber," which is about 4 ft. deep and which expands to an approximately circular section at the base where it rests upon the cast-iron extractor worm casing.

The vertical section fig 2 is familiar to everyone interested in carbonization, and fig. 3 shows the dimensions of the cross-section of the retort at the middle combustion chamber.

Figs. 4 and 5 are longitudinal and cross sections respectively of the vertical retort installation Fig. 6 is a general view of the works, with the retort house in the foreground.

The new waste-heat boiler is similar to the original one. Both were manufactured by Messrs. Spencer-Bonecourt under Kirke's patents. They are horizontal fire-tube boilers with induced draught and superheaters. Each boiler is 34 ft. long over-all, and 5 ft. 6 in. diameter, and each is provided with 416 tubes. The evaporative capacity of each boiler is 4200 lbs. of steam per hour, from and at 212° Fahr. In addition to the usual fittings, each boiler is provided with an electrically-driven fan with draught control equipment, automatic feed-water control of the "Thermofeed" type, the "Hilo" (high and low) water alarm, and duplicate feed pumps.

Conditions under which the Tests were Made.

Previous experience had convinced the writer of the importance of choosing the best period of the year in which to carry out the tests; and, in order to avoid trouble due to possible extremes of cold, it was decided to complete the tests between the months of March and November.

The make of gas was, of course, regulated by the requirements of the district. It was necessary to put retorts out of action from time to time, as required by the fluctuation of the demand, and at other times to regulate the throughput of coal in the several retorts for the same reason.

Previous Working of the Retorts.

Nearly all the tests were carried out in the eight retorts of

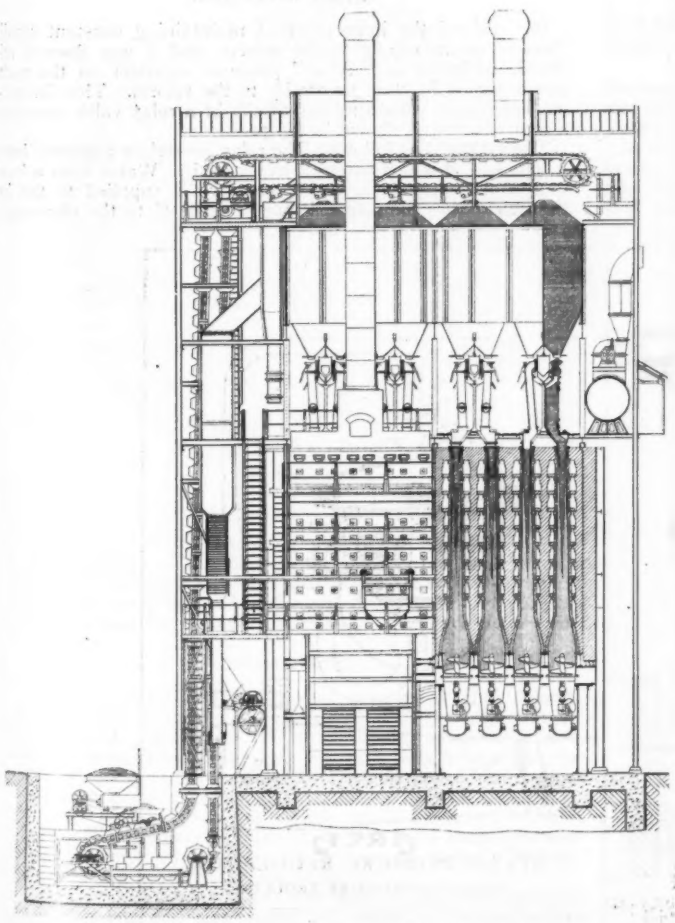


Fig. 4.—Longitudinal Section of Vertical Retorts.

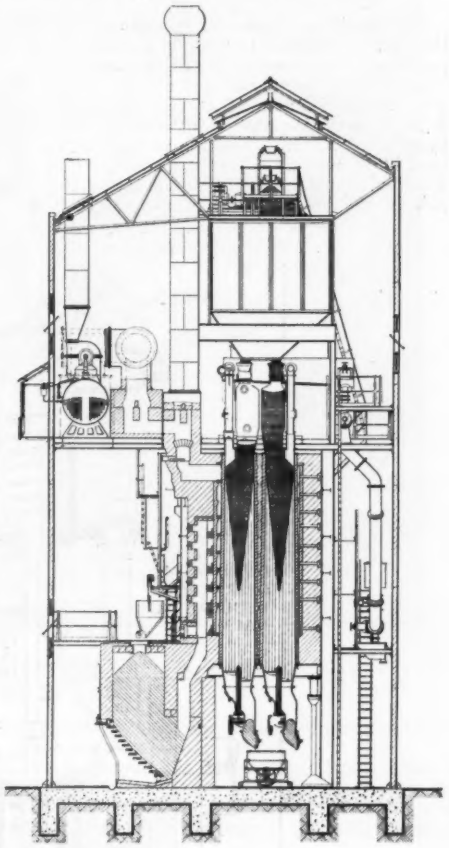


Fig. 5.—Cross-Section of Vertical Retorts.

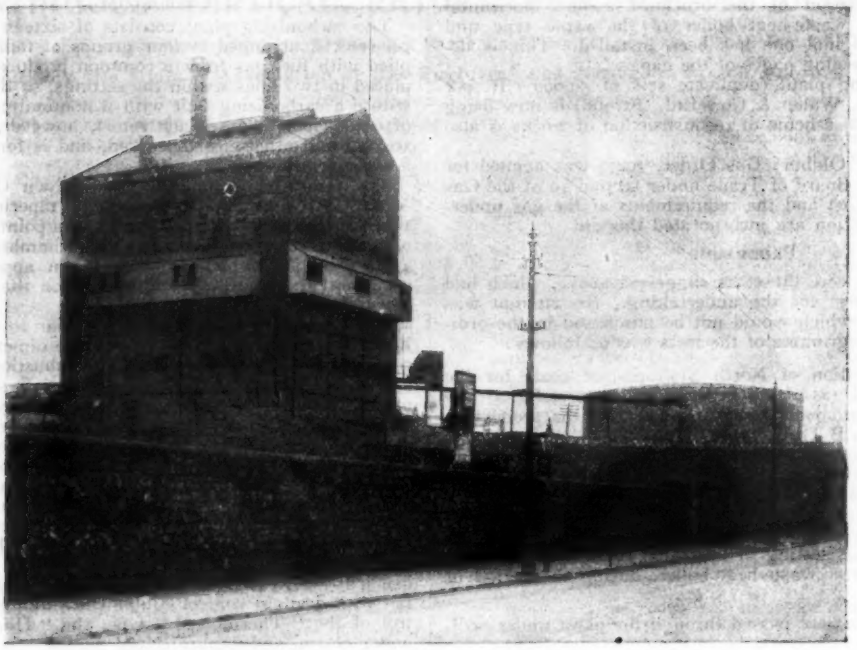


FIG. 6.—GENERAL VIEW OF OLDBURY GAS-WORKS.
The Glover-West Vertical Retort House is in the left foreground.

"B" setting. These retorts, which were in use during the whole period of the tests, had previously been in operation for 783 working days. They remained in excellent condition throughout. "A" setting had previously worked for 649 days. Two retorts from this setting were in operation for the last 24 days of the "S" Test. All the retorts in "A" setting are also in excellent condition.

A portion of the producer walls of both settings was lined with "Lava" bricks prior to the tests.

Operation of the Settings.

The working of the settings during the tests proceeded on lines exactly similar to those of their previous operation. Scurfing was commenced in the eighth week of the period.

In the main producer gas uptake flue a very slight pressure was maintained at the bottom, rising to a maximum at the top. A slight pressure was maintained in the top circulating chambers of the settings, and the vacuum at the inlet of the waste-heat boiler was three-tenths of an inch of water. This vacuum was kept constant by the regulation of the damper on the inlet side of the induced-draught fan of the boiler. Producer fires were cleaned once in 24 hours, with a pricking-up every 12 hours after cleaning.

The gas collecting mains were cleared of heavy tar and run off every 24 hours. They were then filled to the overflow with weak liquor. Continuous circulation of liquor through the mains was found to be unnecessary. Pressure conditions in the collecting mains were very carefully watched. A level gauge was maintained in the collecting main corresponding to a three-tenths vacuum at the inlet to the retort house governor.

Steam Regulation.

We realized the importance of maintaining constant conditions of steam supply to the retorts, and it was deemed advisable to instal an "Arca" pressure regulator on the main steam supply in close proximity to the retorts. This interesting apparatus, consisting essentially of a relay valve operating a control valve, is shown in fig. 7.

The action is as follows: The relay comprises a pivoted lever A, one end of which covers a water jet B. Water from a local source of supply at a steady pressure is supplied to the jet through a throttling and cleaning needle C to the diaphragm

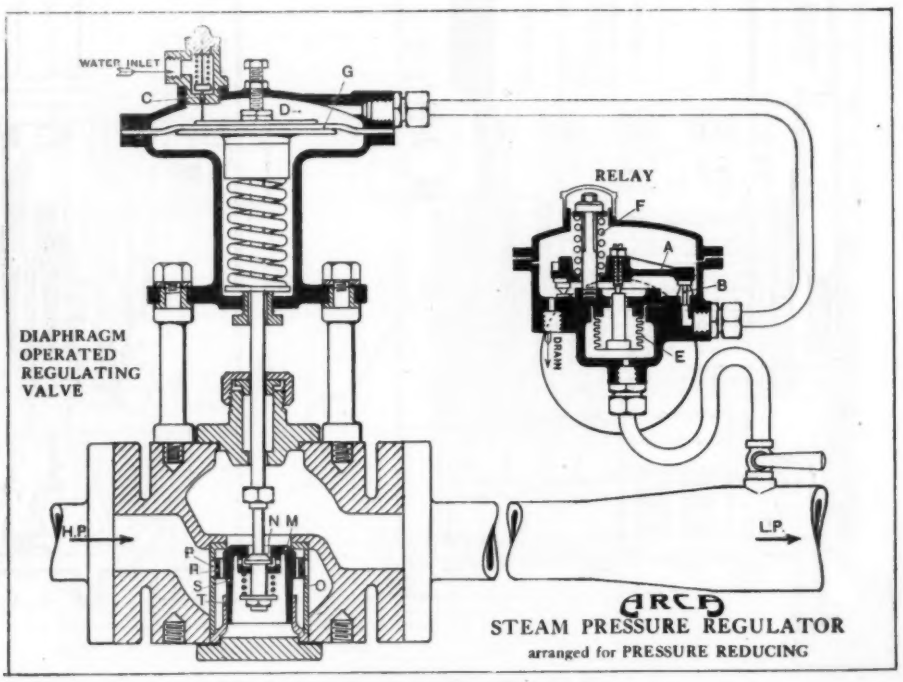


FIG. 7.—"ARCA" STEAM REGULATING APPARATUS.

chamber D of the valve, and thence to the jet. The reduced steam pressure acts on a metal bellows E in the relay body, which is connected to the lever A and counterbalanced by the spring F. It can be seen that any slight change of steam pressure moves the end of the lever nearer to or further from the jet B. The effect of such movements of the lever, though they are very small, is to raise or lower the water pressure between the jet B and the throttling needle C; and these changes of water pressure acting on the spring loaded diaphragm G cause the regulating valve to move away from or towards its seat so as to maintain constant the steam pressure acting on the bellows.

The valve itself is of special design to withstand the heavy duties imposed by regulating the flow of steam. There is a main valve M, and a pilot valve N, built-up in a main liner O. In liner O are specially shaped steam ports P covered by a gallery piece R which is part of the piston S forming the main valve. Piston S works in a balancing liner T. When the whole valve is closed, high-pressure steam builds-up inside the piston S, keeping the valve hard and tight on its seat. The initial opening movement of spindle opens the pilot valve, and this puts the whole valve into steam balance. Further movements of spindle then move the main valve off its seat and simultaneously uncover the ports. The port area, however, is always less than the available seat area, and in consequence the cutting action of steam, inevitable in a regulating valve, takes place harmlessly at the ports, and not at the seat. The valve can be depended upon, therefore, to remain steam-tight, when shut, for long periods. Further, the ports can be shaped as desired to ensure accurate regulation at light loads. The valve is also designed to travel one-quarter the diameter of the seat, so that, except at very light loads, the valve is well away from its seat, and the ports are well uncovered, thus also reducing considerable wear. This travel is obtained by using water at a comparatively low pressure to act on a flexible though substantial diaphragm.

This apparatus maintained a pressure of 23 lbs. per sq. in. at the inlet side of the West-Taylor steam regulating valves without any appreciable variation.

To measure the supply of steam to the retorts we installed a Bailey fluid meter in the steam range. This useful instrument both indicates the rate of flow in pounds per hour, and, by means of an integrator, records the total quantity of steam supplied for a given period. Fig. 8 is a facsimile of one of the charts with the readings marked upon it.

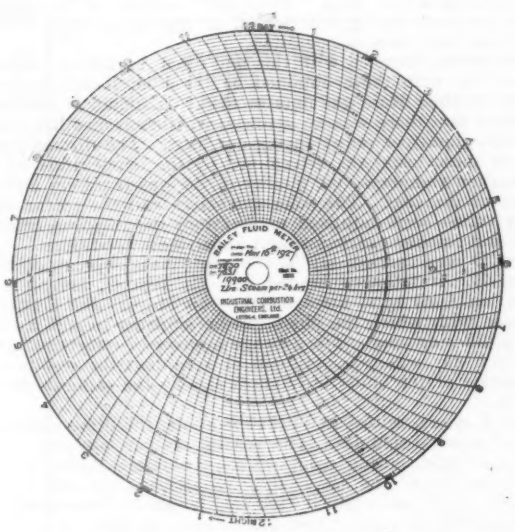


Fig. 8.—"Bailey" Fluid Chart.

The readings of the Bailey fluid meter have been taken as giving the amount of steam passing to the retorts, and no allowance has been made for any condensation or leakage of steam through the asbestos packings of the retort mouthpieces.

Measurements.

The coal supply was arranged so that an adequate tonnage was available to maintain the continuity of the tests. It was discharged at the wharf into small tipping wagons of about 1 ton capacity, which were weighed on a weighbridge and then travelled along a light-gauge rail track and tipped into the feeding hopper of the gravity-bucket conveyor by which it was elevated and distributed in the bunkers above the retort bench.

Coke was discharged from the retort coke chambers every hour into skips which were weighed on the Avery "Toledo" dial weighing machine, shown in fig. 9.

Representative samples of coke were taken from each discharge for analysis, and several representative discharges from each test were reserved, at intervals, for the grading test.

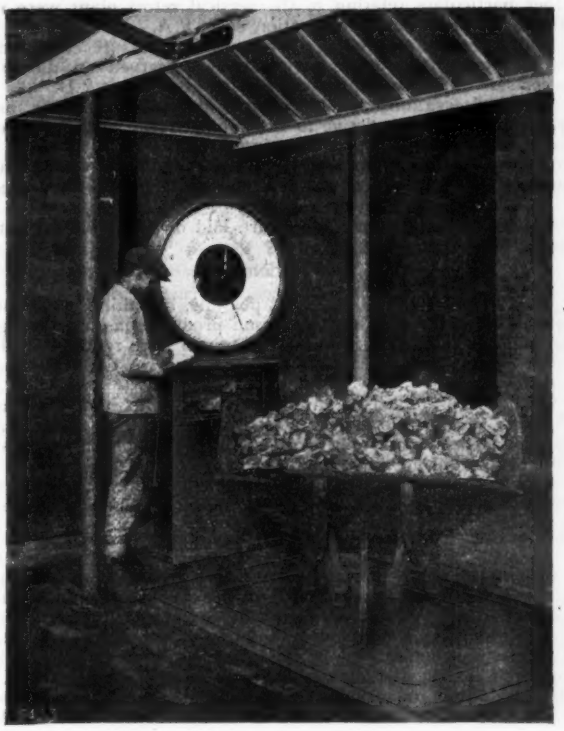


Fig. 9.—"Toledo" Weigher.

The temperatures of the combustion chambers were taken by means of a Cambridge disappearing-filament pyrometer. Those of the waste gases at the inlet and outlet of the waste-heat boiler were taken by means of a Cambridge thermocouple and indicator. (Fig. 10.)

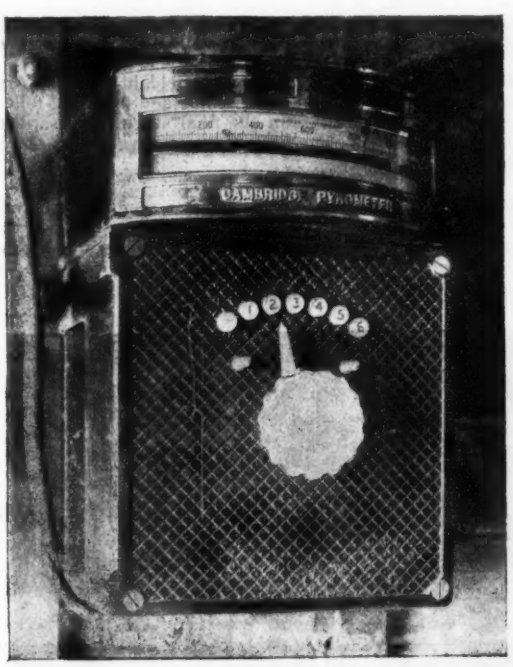


Fig. 10.—Cambridge Thermocouple and Indicator.

The wet and dry purification of the crude coal gas was carried out according to the usual gas-works practice.

The method of working-up the ammoniacal liquor could be considerably improved upon. It is probable, therefore, that the strength of the liquor collected was lower than usual, even when taking into consideration the heavy steaming practised during the whole of the tests.

Control.

Hourly readings of gas and steam temperatures and pressures, temperatures and pressure conditions of the settings, and

other particulars relating to the vertical retort plant were recorded on the general observation sheet "A."

Daily records of producer-gas analysis, pressure conditions, temperatures, and waste-gas analyses, observed on the producer side of the settings, were registered on sheet "B."

Daily observations of temperatures, pressure conditions, and waste-gas analyses relative to the non-producer side of the settings, were recorded upon the printed chart "C."

Hourly records of gas made and general analyses of coal gas, waste gas, and producer gas were entered on the printed sheet "D."

Copies of these record sheets are laid on the table for your inspection.

Sampling.

This was carried out, as far as possible, by taking an aliquot portion from the stream of coal and products passing through the plant. The gross samples so obtained were reduced by the usual coning and quartering methods, to give the laboratory samples.

Coal was sampled from the delivery into the overhead bunkers, during the whole period of elevating. Coke was sampled as delivered from the retorts. Gas samples for analysis were drawn during the whole of each 24-hour test period into a test holder of 10 c.ft. capacity; the usual precautions being taken to avoid lag in delivery or stagnation in connecting pipes.

Analysis of Coal and Coke.

Proximate analyses were carried out under conditions approximating to those described in the Fuel Research Board publication (Physical and Chemical Survey of the National Coal Resources, No. 7) on "Methods of Analysis of Coal." Moisture was determined by heating 2 grammes of the finely powdered coal in a shallow silica dish for one hour at 105° C. After weighing the dried coal, usually the same sample was incinerated in the same vessel for the determination of ash. Volatile matter was determined by heating 1 gramme of the coal in a platinum crucible according to the standard American method.

Calorific values were determined in a Roland-Wild calorimeter (with mechanical stirring and electric firing); this being checked for accuracy several times against a Mahler-Donkin bomb calorimeter. Ultimate analyses were also carried out with as little departure as possible from the recognized methods.

Carbon and hydrogen were determined by combustion; the water formed being collected in a calcium chloride **U** tube and the CO_2 in another **U** tube charged with sofnolite.

Sulphur was determined in the sodium peroxide melt from the Roland-Wild calorimeter, obtained in the determination of calorific value.

Nitrogen was determined by the Kjeldahl-Gunning-Arnold method—*i.e.*, using potassium bisulphate and mercury, followed by potassium permanganate in the final stage, as described in the above publication. The percentage of oxygen was obtained by difference.

Analysis of Gases.

Samples of coal gas were analyzed in a modified "Birmingham" apparatus. The soluble constituents are removed by means of the usual reagents, while the methane and hydrogen are determined by explosion with air instead of combustion over copper oxide—see fig. 11.

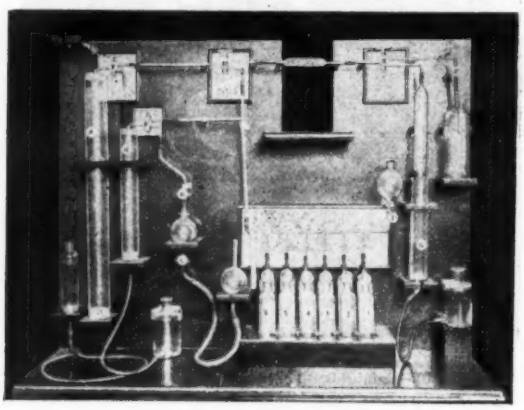


Fig. 11.—Modified "Birmingham" Apparatus.

Producer gases were analyzed in the same apparatus, while waste gases were sampled and analyzed in an Orsat.

Calorific values of the coal gas, as made, were indicated on a "Sigma" instrument, and of the town gas were recorded continuously on a Beasley recorder; both these instruments being frequently checked by means of a standard Boys calorimeter. In addition to this the sample of gas in the test holder was tested for calorific value four times a day in the Boys calorimeter.

Total ammonia in the scrubbed gas was determined, as usual, by bubbling a measured quantity of the gas through a train of wash bottles containing dilute sulphuric acid, distilling-off the absorbed ammonia by means of caustic soda into standard acid, and titration with standard alkali.

Cyanogen and hydrocyanic acid in the gas were determined together by the polysulphide method, being converted to thiocyanate and titrated with standard silver nitrate solution. The results are stated as pounds of crystalline sodium ferrocyanide per 10,000 c.ft. of gas.

Ammonia in Liquor.

The total ammonia content of average samples of liquor was determined by distillation with caustic soda into standard acid, and titration with standard alkali. The ammonia content thus formed was then calculated to the equivalent yield of 10-oz. liquor per ton of coal.

Description of Carbonizing Tests.

As appendixes, the whole of the observations taken during the progress of the tests are given in tabulated form, and the results worked out as nearly as possible on the plan standardized by the Fuel Research Board. The following general remarks with regard to each testing may be noted here. The waste-heat boiler was in continuous service throughout all the tests with the exception of "P," "Q," and "R," when it was shut down to permit of alterations in the main flues necessitated by the installation of the second waste-heat boiler. During these three tests saturated steam was supplied from the works Lancashire boiler.

Test A, on 97 tons of North Staffs. No. 1 washed beans, was carried out between 4 p.m. on April 8, 1927, to 9 a.m. on April 11. The eight retorts in "B" setting were in continuous operation during the test.

This test must be regarded as merely preparatory; the setting had only just been brought into operation, and was being generally "tuned-up" for efficient working.

Test B was a continuation of Test A after the adjustments were considered to be satisfactory. It was carried out on 157 tons of the same class of coal from 9 a.m. on April 11, to 4 p.m. on April 15. The result of the adjustment is seen in the greatly improved yield both per ton and per retort.

Test C lasted for the period of ten days from 4 p.m. on April 15 to the same hour on April 25. 250 tons of Yorkshire coal in 1¾ in. to 1 in. nuts was passed through the retorts. Several retorts had to be "stood off" because of fluctuations in the demand during this period, so that an average of 6·25 retorts per day were in operation.

The results obtained with this and other Yorkshire coals are comparable with those obtained by the Fuel Research Board on the Mitchell Main gas nuts in 1920. It should be observed, however, that there was no artificial restriction or otherwise of the throughput per retort during our tests. The throughput in each of these tests was determined by the temperature of the combustion chambers, the quality of the gas required, and the nature of the coal. The coke extractors and the steam regulating valves were adjusted to maintain the required calorific value and complete carbonization under these conditions.

Test D was carried out on the same class of coal as Tests A and B. It followed immediately on Test C, lasting from 4 p.m. on April 25 to the same time on May 2, and illustrates the ease with which the plant can be adjusted to suit a fairly widely differing coal. The average number of retorts in operation each day was 7·54. It will be seen that the results over this period of 168 hours are almost exactly the same as during Test B.

Test E was a return to Yorkshire coals, this time about 223 tons of washed doubles. The results are, at any rate as regards gas yield, within 1 p.ct. of those obtained with the other Yorkshire coals, and show that 100 therms per ton at 460 B.Th.U. can be maintained over long periods. This test began on May 2 at 4 p.m. and lasted till 4 a.m. on May 10, a period of 7½ days.

Test F, from 4 a.m. on May 10 to 10 a.m. on May 18, 8¼ days, was carried out on 232 tons of Derbyshire washed nuts with an average of six retorts per day in operation.

This is a high-volatile coal containing 41·82 p.ct. of volatile combustible matter on the air-dried sample, with a non-swelling coke and a high oxygen content. The high gas yield per ton and production per retort were to be expected.

Test G was a long-period test, 11½ days from 10 a.m. on May 18 to 10 p.m. on June 3, on a mixture of the Staffordshire beans 41 p.ct., Derbyshire nuts 17 p.ct., and the Yorkshire washed doubles 18 p.ct., with 24 p.ct. North Wales (nutty) slack, a total of 537 tons. The throughput per retort was higher than that obtained with any of the constituent coals, and the thermal yield per ton was excellent, though not quite equal to the arithmetical average of results from the several coals.

Test H was a remarkable one. We had had no previous experience of this coal, which was a Derbyshire washed double; and the yield of 116·68 therms at 450 B.Th.U. was a surprise to us. The test was not a short one; it lasted for 232 hours, nearly ten days, from 10 p.m. on June 3 to 2 p.m. on June 13. The coal is not exceptionally high in volatiles (37·72 p.ct. on

the air-dried sample). The low throughput is probably due to the swelling nature of the coke.

It was hoped that we should be able to make another test of the same coal before presenting these figures to the Association. This, however, proved impossible. It need only be said that the methods of measurement and operation were exactly the same as in all other tests. It is to be presumed that it was an exceptional sample of coal.

Test I lasted from 2 p.m. on June 13 to 4 p.m. on June 20 on about 203 tons of Yorkshire 2 in. by 1 in. washed doubles. The results closely resembled those obtained with the other Yorkshire coals.

Test J, from 4 p.m. on June 20 to 3 p.m. on June 29, was carried out on 256 tons of another mixture of the same coals as used in Test G. The proportions were a little different, being 30 p.ct. Staffs., 26 p.ct. Derbyshire, 19 p.ct. Yorkshire, and 25 p.ct. North Wales. The results are essentially the same.

Test K was a return to the same Staffordshire coal as in Tests B and D. Some 202 tons were carbonized between 3 p.m. on June 29 and 4 p.m. on July 6. The gas yield per ton of 82 therms at 470 B.Th.U. is, of course, considerably better than the 85 therms at about 440 B.Th.U. obtained in Tests B and D. The throughput per retort is correspondingly lower.

Test L was carried out between 4 p.m. on July 6 to 12 noon on July 15, on about 277 tons of another mixture. This time, 25 p.ct. Staffordshire No. 2 washed beans, 34 p.ct. Derbyshire washed beans, 23 p.ct. Yorkshire nuts, and 18 p.ct. North Wales slack. The results call for no further comment.

Test M, on about 163 tons of Yorkshire gas nuts, lasted for some 6½ days, from 12 noon on July 15 to 9 p.m. on July 21, with an average of 6¾ retorts in operation. Nearly 96 therms per ton at a calorific value of 497 B.Th.U. is extremely good even for this coal, but the production per retort is a disappointment.

Test N, from 9 p.m. on July 21 to 7 p.m. on July 26, on 139 tons of Yorkshire 1½ in. by ¾ in. washed gas nuts also showed the very fine result of 97·25 therms per ton, making gas at 500 B.Th.U. It will be seen from an inspection of the curves in fig. 12 that this result is essentially equal to the high figures obtained in Test H.

Test O lasted from 7 p.m. on July 26 to 9 a.m. on Aug. 5, a period of 230 hours on 261 tons of a mixture similar to Test L, with slightly different proportions—namely, 26 p.ct. Staffs., 25 p.ct. Derbyshire, 30 p.ct. Yorkshire, and 19 p.ct. North Wales. The results are slightly better than in Test L.

Test P on 174 tons of Derbyshire washed singles, lasting from 9 a.m. on Aug. 5 to 4 a.m. on Aug. 12, shows 90 therms per ton at 459 B.Th.U., a result which is not out of the ordinary.

Test Q lasted from 4 a.m. on Aug. 12 to 11 p.m. on Aug. 17, on a sample of 171⅓ tons of Yorkshire 2 in. by 1 in. washed double nuts. The results are consistent.

Test R covered a period of 153 hours from 11 p.m. on Aug. 17 to 8 a.m. on Aug. 24, on 178 tons of Yorkshire 2 in. by 1 in. washed double nuts. The result of 97 therms at 473 B.Th.U. is of interest in view of the tests carried out by the Fuel Research Board on a similar coal.

Test S covers the longest period in this series—no less than two calendar months, from 8 a.m. on Aug. 24 to 6 p.m. on Oct. 24. The coal carbonized was a mixture, as even and thorough as possible, of six coals—namely, 45 p.ct. Staffordshire, 28 p.ct. Yorkshire, 9 p.ct. Derbyshire, and 18 p.ct. of North Wales nutty slack, a total of 2172 tons. An average of 8·44 retorts per day was in operation during this period; two retorts of A setting being brought into operation during the last 24 days.

Fig. 12 is a series of curves showing the theoretical effect of steaming in continuous vertical retorts. On these have been plotted the results of the several tests (except Test A), together with those of the three tests F, G, and H, on Mitchell Main nuts at the Fuel Research Station (see Table I., p. 45, Report of the Fuel Research Board for the years 1920, 1921, First Section: "Steaming in Vertical Gas Retorts"). The position of the points relative to these curves gives a better idea than the figures themselves of the success and efficiency of the steaming process.

DIAGRAM SHOWING THEORETICAL RESULTS OF STEAMING IN CONTINUOUS VERTICAL RETORTS.

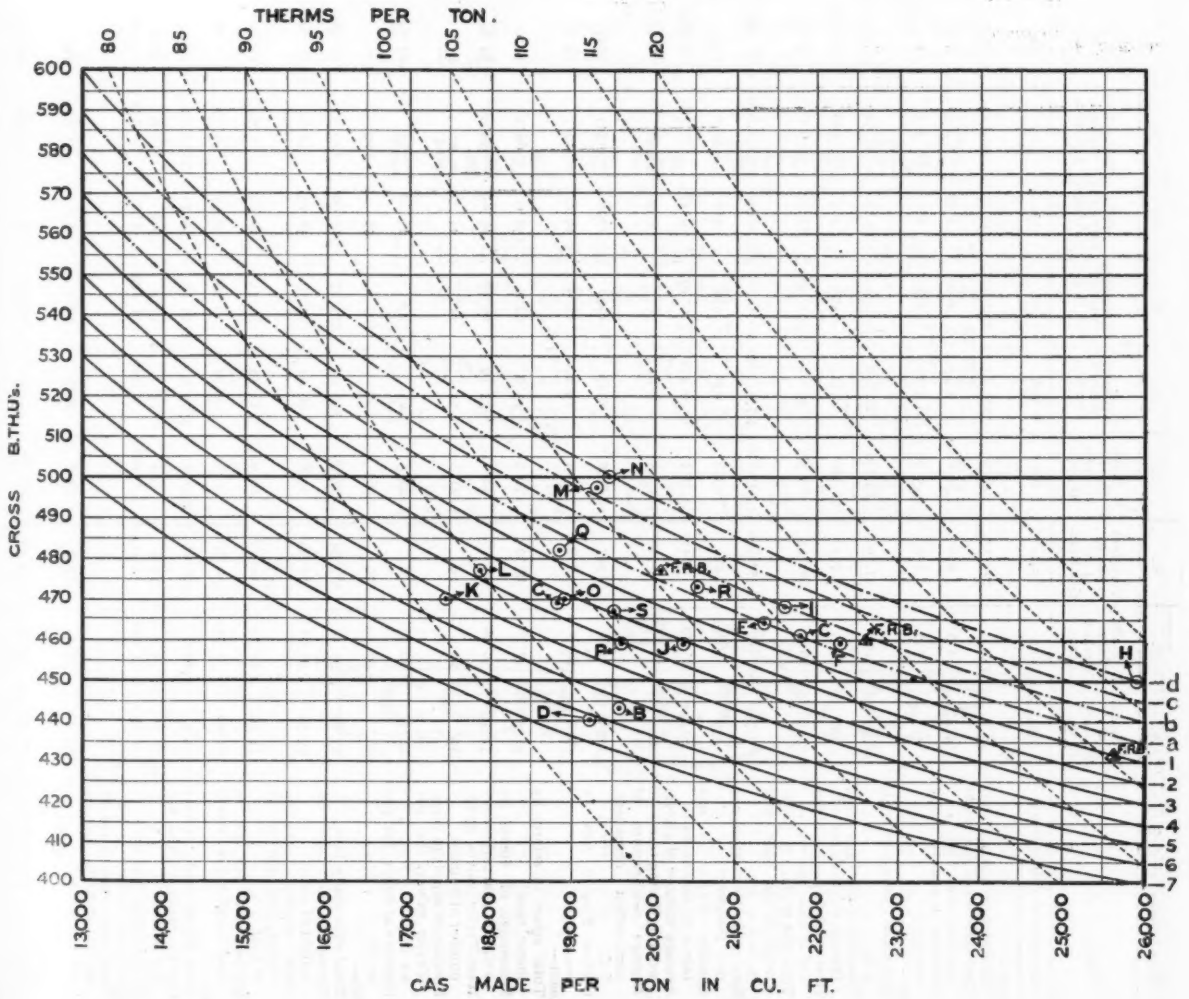


FIG. 12.—STEAMING CHART.

The points "B" to "S" refer to the tests made at Oldbury. The triangular points "F. R. B." refer to tests on Mitchell Main Gas Nuts made by the Fuel Research Board.

TABLE I.—*Oldbury Gas Department.*

GLOVER-WEST 40-IN. (NEW MODEL) TYPE VERTICAL RETORTS WITH KIRKE PATENT HORIZONTAL WASTE-HEAT BOILER. MAIN DETAILS OF CARBONIZATION TESTS.

Test Number	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.
Coal	N. Staffs. No. 1 Washed Beans.	N. Staffs. No. 1 Washed Beans.	Yorkshire 1¾ in. by 1 in. Gas Nuts.	N. Staffs No. 1 Washed Beans.	Yorkshire Washed Doubles.	Derbyshire Washed Gas Nuts.	Staffs., Yorkshire, N. Wales.	Derbyshire Washed Doubles.	Yorkshire 2 in. by 1 in. Washed Doubles.	Staffs., Yorkshire, N. Wales.	N. Staffs. No. 2 Washed Beans.	Staffs., Yorkshire, N. Wales.	Yorkshire Dry Gas Nuts.	Yorkshire 1¼ in. by ¾ in. Washed Gas Nuts.	Staffs., Yorkshire, N. Wales.	Derbyshire Washed Singles.	Yorkshire 2 in. by 1 in. Doubles.	Yorkshire 2 in. by 1 in. Doubles.	Staffs., Yorkshire, N. Wales.
Duration of Test in Hours	65.	103.	240.	168.	180.	198.	396.	232.	170.	215.	169.	212.	153.	118.	230.	163.	139.	153.	1474.
Coal—																			
Total coal carbonized, tons	97	157	250'35	246'95	222 65	232'15	536'95	204'15	202'75	256'45	201'75	277'35	162'70	138'9	260'80	174'40	171'50	177'55	2171'60
Coal carbonized per retort per day, tons	4'477	4'57	4'0	4'68	4'34	4'69	4'72	3'52	4'21	4'40	4'09	4'49	3'93	4'04	4'46	4'01	4'23	4'42	4'19
Moisture in coal, p.ct. by weight	5'7	5'7	3'4	5'70	3'2	2'8	4'1	3'3	2'3	3'3	3'4	5'6	1'9	2'1	3'9	3'3	1'8	2'7	3'8
Gas—																			
Gas made per ton of coal, c.ft.	18,590	19,590	21,790	19,220	21,340	22,300	18,820	25,920	21,590	20,370	17,450	17,890	19,290	19,450	18,900	19,600	18,820	20,530	19,510
Calorific value of gas made (gross), B.Th.U. per c.ft.	407	443	461	440	464	459	469	450	468	459	470	477	497	500	470	459	482	473	467
Heat value of gas made per ton of coal, therms	75'66	86 78	100'45	84'57	99'02	102'36	88'27	116 64	101'04	93'50	82'02	85'34	95'87	97'25	88'83	89'96	90'71	97'11	91'11
Total gas made, c.ft. (saturated at 60° Fahr. and 30 in.)	1,803,700	3,076,100	5,454,600	4,745,800	4,751,700	5,176,700	10,104,900	5,291,600	4,377,700	5,223,900	3,520,000	4,950,100	3,138,200	2,701,600	4,929,200	3,418,600	3,227,800	3,645,200	42,367,900
Gas made per retort per day, therms	339	397	402	396	430	480	417	410 6	425	411	335	383	377	393	396	361	384	429	382
Specific gravity of gas (air = 1), calculated	0'494	0'479	0'486	0'477	0'472	0'497	0'485	0'480	0'484	0'475	0'453	0'469	0'459	0'445	0'456	0'472	0'437	0'470	0'472
Average number of retorts working during test	8.	8	6'26	7'54	6'84	6	6'90	6	6'80	6'50	7	7	6'50	7	6'1	6'4	7	6'3	8'44
Average temperature of combustion chambers, °C.	1298	1298	1347	1290	1347	1298	1298	1347	1347	1298	1298	1347	1347	1347	1347	1347	1347	1347	1347
Carbon dioxide, p.ct. in waste gases	18'8	18'9	18'8	19'4	19'2	18'9	19'0	19'1	19'2	18'9	18'7	18'7	16'2	16'5	17'0	17'9	18'5	18'6	18'7
Steam—																			
Total steam to retorts by meter, tons	31'5	47'1	86'0	70'9	73'9	62'4	138'6	68'1	70'6	84'3	72'1	78'9	53'1	40'3	90'2	50'7	50'5	60'6	583'5
Percentage of steam by weight of coal carbonized	32'47	30'00	34'35	28'71	33'19	26'88	25'81	33'36	34'82	32'87	35'74	28'45	32'64	29'01	34'59	29'08	29'45	34'13	26'87
West-Taylor valves open, number of notches	20	20	20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Pressure of supply to West-Taylor valves, lbs. per sq. in.	20'5	20'5	22	22'5	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Pressure at boiler, lbs. per sq. in.	96	98	96	96	100	100	98	100	100	98	100	100	100	98	100	75	75	75	100
Coke—																			
Total coke made, tons	57'82	90'44	157'54	135'36	135'62	129'47	313'00	120'37	118'38	148'50	121'94	153'90	101'79	84'99	160'94	101'75	109'51	92'87	1274'32
Percentage of coke on weight of coal	59'59	57'61	62'93	54'81	60'91	55'77	58'29	58'96	58'39	57'91	60'44	55'49	62'56	61'19	61'71	58'33	63'85	52'31	58'68
Coke made, including breeze, cwt. per ton of coal	11'92	11'52	12'59	10'96	12'18	11'15	11'66	11'79	11'67	11'58	12'09	11'10	12'51	12'24	12'34	11'67	12'77	10'46	11'74
Breeze, cwt. per ton of coal (passing ¾-in. sieve)	1'04	0'95	0 96	0'83	0'94	0'99	0'99	0'80	0'78	0'89	0'88	0'83	0'94	0'72	1'00	0'78	0'69	0 73	1'01
Tar—																			
Total dry tar made, gallons	1571'4	2480'6	4406'16	3951'2	3874'1	4155'48	9235'54	3797'19	3649'5	4462'23	3470'1	4742'68	2977'41	2583'54	4537'92	3121'76	3001'25	3213'65	37,788'4
Dry tar made, gallons per ton of coal	16 2	15'8	17'6	16'0	17'4	17'9	17'2	18'6	18'0	17'4	17'2	17'1	18'3	18'6	17'4	17'9	17'5	18'1	17'4
Specific gravity of tar	1'090	1'091	1 114	1'100	1'090	1'120	1'115	1'132	1'121	1'090	1'095	1'126	1'115	1'090	1'097	1'110	1'115	1'095	1'105
Ammoniacal liquor—																			
Total liquor calculated to 10 oz. strength, gallons per ton of coal	34'4	35'4	39'7	33'8	38'5	33'2	35'3	33'6	38'2	30'6	31'8	33'6	37'4	34'4	32'2	33'7	36'4	39'1	33'4
Ammonium sulphate (pure) present in liquor, lbs. per ton of coal (calculated)	28'97	29'81	33'43	28 46	32'42	27'95	29'72	28'29	32'17	25'77	26'78	28'29	31'50	28'97	27'11	28'37	30'65	32'92	28'12

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TABLE I. (*continued*).

Ammoniacal liquor (continued)																		
Ammonium sulphate (pure) escaping in gas leaving scrubber, lbs. per ton of coal (calculated)	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	·0866	*Nil*	*Nil*	·0599	*Nil*	*Nil*	·1090	*Nil*	*Nil*	*Nil*	·4790	·3554	·1481	*Nil*
Fuel to heat settings—																			
Coke used in producer, tons	18·85	29·15	48·33	46·11	47·1	48·05	101·9	37·7	38·3	48·9	37·1	48·3	33·8	26·1	50·1	34·07	32·6	30·2	403·5
Coke used per setting per 24 hours, tons	6·96	6·79	4·83	6·59	6 28	5·82	6·18	3·90	5·41	5·46	5·27	5·47	5·30	5·31	5·23	5·02	5·63	4·74	5·50
Coke used p.ct. by weight of coal carbonized when 8 retorts are in operation	19·43	18·57	15·10	17·60	18·09	15·52	16·37	13·86	16·06	15·52	16·11	15·23	16·88	16·45	14·66	15·65	16·63	13·40	16·41
Coke used, lbs. per therm of gas produced when 8 retorts are in operation	5·75	4·79	3·36	4·66	4·09	3·39	4·16	2·66	3·56	3·71	4·39	4·01	3·95	3·79	3·70	3·89	4·11	3·09	4·03
Waste-heat boiler—																			
Water evaporated during test, gallons	12,590	21,160	46,550	30,870	36,540	37,090	72,550	37,600	24,550	32,980	24,580	30,230	22,000	18,460	34,120	..	..	..	272,410
Water evaporated per hour actual, gallons	193·7	205·4	194·0	183·8	203·0	187·3	183·2	162·1	144·4	153·4	145·4	142·6	143·8	156·4	148·3	..	..	..	184·8
Water evaporated per lb. of coke charged to producer actual, lbs.	2·982	3·241	4·310	2·991	3·463	3·446	3·178	4·451	2·861	3·011	2·958	2·794	2·906	3·158	3·042	..	..	..	3·014
Equivalent evaporation from and at 100° C. per lb. of coke charged (average superheat 120° Fahr. and feed water temp. 52° Fahr.)	3·779	4·106	5·462	3·789	4·388	4·367	4·027	5·640	3·625	3·815	3·748	3·540	3·682	4·001	3·855	..	..	..	3·819

TABLE II.—*Temperatures and Pressures in System.*

Test No.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.
Temperatures of retort setting (° C.)—																			
Flue gas circulating chamber No. 3	860	860	870	860	870	860	860	870	870	870	860	870	870	870	870	870	870	870	870
Flue gas circulating chamber No. 2	980	980	1020	980	1020	980	980	1020	1020	1020	980	1020	1020	1020	1020	1020	1020	1020	1020
Flue gas circulating chamber No. 1	1240	1240	1260	1240	1260	1240	1240	1260	1260	1260	1240	1260	1260	1260	1260	1260	1260	1260	1260
Combustion chamber No. 6	1290	1290	1340	1290	1340	1290	1290	1340	1340	1340	1290	1340	1340	1340	1340	1340	1340	1340	1340
Combustion chamber No. 5	1290	1290	1340	1290	1340	1290	1290	1340	1340	1340	1290	1340	1340	1340	1340	1340	1340	1340	1340
Combustion chamber No. 4	1310	1310	1350	1310	1350	1310	1310	1350	1350	1350	1310	1350	1350	1350	1350	1350	1350	1350	1350
Combustion chamber No. 3	1310	1310	1350	1310	1350	1310	1310	1350	1350	1350	1310	1350	1350	1350	1350	1350	1350	1350	1350
Combustion chamber No. 2	1310	1310	1350	1310	1350	1310	1310	1350	1350	1350	1310	1350	1350	1350	1350	1350	1350	1350	1350
Combustion chamber No. 1	1280	1280	1350	1280	1350	1280	1280	1350	1350	1350	1280	1350	1350	1350	1350	1350	1350	1350	1350
Average of combustion chambers (° C.)	1298	1298	1347	1298	1347	1298	1298	1347	1347	1347	1298	1347	1347	1347	1347	1347	1347	1347	1347
Temperatures in air flues of retort setting (° C.)—																			
Primary air entering producers	10	10	11	11	14	14	18	18	18	19	19	18	20	21	22	20	20	16	14
Secondary air entering settings	16	16	18	18	19	19	20	19	19	21	22	23	23	23	24	23	22	22	20
Temperatures in waste-gas flues of setting (° C.)—																			
Flue gases leaving setting	890	890	910	890	910	900	900	920	920	940	940	940	940	940	940	940	940	940	940
Temperatures on plant (° C.)—																			
Gas leaving retort	390	390	390	390	390	390	395	395	395	395	395	395	395	395	395	395	395	395	395
Gas leaving collecting main	102	103	103	103	104	104	104	104	104	104	104	104	104	104	104	104	104	103	102
Coke leaving retort	160	164	169	160	172	179	165	167	177	160	168	153	168	176	179	130	121	134	180
Pressures on plant in inches of water—																			
Collecting main	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
Retort house governor inlet	−0·3	−0 3	−0·3	−0·3	−0·3	−0·3	−0·3	−0 3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3	−0·3
Retort house governor outlet	−4·0	−4·0	−4 0	−4 0	−4 0	−4·0	−4·0	−4 0	−4 0	−4·0	−4·0	−4·0	−4 0	−4·0	−4·0	−4·0	−4·0	−4·0	−4·0
Pressure of producer gas in main producer gas uptakes in inches of water—																			
Pressure at top of uptakes	0·2	0·2	0·2	0 2	0 2	0·2	0·2	0 2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2
Pressure at bottom of uptakes	0·05	0·05	0 05	0·05	0·05	0·05	0 05	0 05	0·05	0·05	0·05	0·05	0·05	0·05	0·05	0·05	0·05	0·05	0·05
Pressure of waste gases in setting in inches of water—																			
Pressure of waste gases in top circulating chambers	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12	0·12
Pressure of waste gases above main waste-gas control dampers	−0·15	−0·15	−0·15	−0·15	−0·15	−0 15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15	−0·15
Steam temperatures in °C. and steam pressures in lbs. per sq. in. on plant—																			
Steam pressure at superheater on waste-heat boiler, lbs. per sq. in.	96	98	96	96	100	100	98	100	100	98	100	100	100	98	100	..	..	..	100
Temperature of steam at superheater on waste-heat boiler, °C.	220	220	225	230	230	230	228	234	236	240	240	238	245	240	235	..	..	..	240
Steam pressure at valves to retorts, lbs. per sq. in.	20·5	20·5	22	22·5	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Steam temperature at inlet to retorts, °C.	156	160	162	168	160	161	166	160	169	167	160	163	170	164	160	109	111	109	162
Particulars relative to waste-heat boiler—																			
Temperature of waste gases entering boiler, °C.	860	860	880	860	880	880	870	880	890	900	910	910	910	910	910	910	910	910	900
Pressure of waste gases entering boiler in inches	−0·3	−0·3	−0 3	−0·3	−0·3	−0 3	−0·3	−0·3	−0·3	−0·3	−0 3	−0·3	−0·3	−0·3	−0·3	..	..	..	−0·3
Temperature of waste gases leaving boiler, °C.	186	194	198	190	196	198	192	190	194	198	198	196	198	195	198	..	..	..	198
Pressure of waste gases at outlet of boiler below fan in inches	−1·3	−1·3	−1·3	−1·3	−1·3	−1 3	−1·3	−1·3	−1 3	−1·3	−1·3	−1·3	−1·3	−1 3	−1·3	..	..	..	−1·3

TABLE III.—*Coal Analyses.*

Test No.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.
Proximate analysis—																			
Moisture, p.ct.	1·97	1·97	0·79	1·97	1·50	2·35		2·40	1·28	2·64	2·06	5·39	1·26	1·75	2·78	2·25	1·28	1·85	3·17
Organic volatile matter, p.ct.	35·68	35·68	36·86	35·68	34·73	41·82		37·72	35·91	35·46	35·05	35·49	36·22	34·59	34·86	35·89	34·93	35·57	35·10
Fixed carbon, p.ct.	56·98	56·98	59·97	56·98	59·42	53·19		57·07	59·41	56·10	55·73	51·36	54·83	58·67	54·67	56·62	58·43	58·67	54·34
Ash, p.ct.	5·37	5·37	2·38	5·37	4·35	2·64		2·81	3·40	5·80	7·16	7·76	7·69	4·99	7·69	5·24	5·36	3·90	7·39
Ultimate analysis— (Dry coal.)																			
Ash, p.ct.	5·48	5·48	2·40	5·48	4·42	2·70		2·88	3·44	5·95	7·31	8·20	7·79	5·08	7·91	5·36	5·43	3·98	7·63
Carbon, p.ct.	78·17	78·17	83·05	78·17	80·21	75·86		78·41	81·60	77·82	76·03	74·46	77·04	80·67	76·49	77·66	80·39	81·06	76·46
Hydrogen, p.ct.	4·71	4·71	5·02	4·71	4·81	5·14		4·87	4·88	4·64	4·36	4·59	5·04	5·01	4·60	4·85	4·83	4·68	5·25
Nitrogen, p.ct.	1·35	1·35	1·60	1·35	1·63	1·45		1·98	1·46	1·73	1·73	1·71	1·68	1·67	1·64	1·70	1·65	1·67	1·65
Sulphur, p.ct.	2·14	2·14	1·27	2·14	2·73	1·16		2·01	1·65	2·05	2·03	1·35	2·85	1·91	1·99	2·51	1·92	1·41	2·23
Oxygen (by diff.) p.ct.	8·15	8·15	6·66	8·15	6·20	13·69		9·85	6·97	7·81	8·54	9·69	5·60	5·66	7·37	7·92	5·78	7·20	6·78
Calorific value, B.Th.U. per lb.	13,170	13,170	14,190	13,170	13,170	13,120		13,450	13,760	13,350	13,300	12,000	13,100	13,700	12,850	13,300	13,700	13,850	13,000

TABLE IV.—*Hand Grading of Coke from Retorts and Proximate Analysis of Coke.*

Test No.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.
Grading—																			
Over 4 in., p.ct.	3·6	2·9	12·3	5·6	11·4	4·1	6·2	1·9	11·3	7·5	3·9	5·2	9·4	13·8	8·7	5·2	6·3	4·2	11·0
Between 4 in. and 3 in., p.ct.	14·4	16·1	18·6	11·9	14·9	20·6	16·2	14·4	18·6	20·3	17·1	21·2	19·0	15·1	18·2	12·3	15·3	15·3	9·6
Between 3 in. and 2 in., p.ct.	30·9	27·4	24·1	25·1	27·5	25·0	29·1	32·6	24·1	28·2	28·8	14·7	26·6	28·7	25·9	23·7	36·9	34·9	26·2
Between 2 in. and 1½ in., p.ct.	28·7	26·2	22·7	30·0	22·6	20·0	19·4	28·1	26·3	16·4	24·2	29·6	20·2	18·0	25·4	30·4	23·9	25·1	22·5
Between 1½ in. and ¾ in., p.ct.	13·7	19·2	14·7	19·8	15·9	21·4	20·6	16·2	13·0	19·9	18·7	21·8	17·3	18·5	13·7	21·7	12·2	13·5	22·1
Below ¾ in., p.ct.	8·7	8·2	7·6	7·6	7·7	8·9	8·5	6·8	6·7	7·7	7·3	7·5	7·5	5·9	8·1	6·7	5·4	7·0	8·6
Proximate analysis—																			
Moisture, p.ct.	1·64	1·42	1·73	1·01	0·92	1·18	1·49	1·55	1·10	0·86	1·42	0·84	0·80	0·93	1·20	1·10	1·16	1·20	1·04
Organic volatile matter, p.ct.	0·35	0·35	0·62	0·24	0·36	0·29	0·11	0·30	0·21	0·18	0·36	0·17	0·25	0·53	0·20	0·31	0·13	0·26	0·12
Fixed carbon, p.ct.	89·59	90·46	94·26	90·83	91·71	93·57	88·60	92·94	92·76	90·54	88·81	88·50	89·67	90·12	87·49	89·15	89·34	92·34	88·29
Ash, p.ct.	8·42	7·77	3·39	7·92	7·01	4·96	9·80	5·21	5·93	8·42	9·41	10·49	9·28	8·42	11·11	9·44	9·37	6·20	10·55

THE TABULATED RESULTS.

Table I. gives the main details of the results of the several tests. It is prepared as nearly as possible on the lines of the tests reported by the Fuel Research Station. Naturally the data are different, but they have been arranged in logical order.

With regard to the fuel consumption, it should be pointed out that in the calculations account has been taken of the fact that during the test period the whole eight retorts have had to be maintained at working temperatures to be ready for the emergencies of the fluctuating demand. The gross weight of coke consumed in the producers can be taken as practically constant.

Table II. gives the temperatures and pressures throughout the system during the several tests.

Table III. gives the results of the analyses of average samples of each coal taken as the several tests proceeded. These call for no comment. The proximate analyses and the calorific values are based on the air-dried sample and the ultimate analyses on the moisture-free sample.

Table IV. gives grading tests and proximate analyses of coke sampled during the several tests. Test S for the long period of two months may be taken as representative of the results obtained for the year's working. Without breaking, 46·8 p.ct. of the coke is large, 22·5 p.ct. is described as nuts, 22·1 p.ct. is an excellent small nut coke, and 8·6 p.ct. is breeze suitable for boiler fuel. The moisture content averages no more than 1 p.ct. On the whole it is an excellent free-burning dry fuel worth considerably more to the consumer than any water-quenched coke.

Table V. gives the analyses of the gas samples taken during the tests.

TABLE V.—*Coal Gas Analysis.*

Test.	Constituent Gases, P.Ct. CO_2	C_nH_m.	O_2.	CO.	H_2.	CH_4.	N_2.	Actual Calorific Value, B.Th.U. per C.Ft.	Specific Gravity. Air = 1.
A	5·1	1·6	1·6	15·6	48·4	16·9	10·8	407	0·494
B	6·1	1·7	0·4	16·8	49·1	19·9	6·0	443	0·479
C	4·5	2·1	1·1	15·9	46·6	21·8	8·0	461	0·486
D	4·5	2·0	1·0	16·8	48·9	18·9	7·9	440	0·477
E	4·2	2·1	0·8	16·1	48·1	21·4	7·3	464	0·472
F	4·4	2·0	0·6	19·9	45·6	20·9	6·6	459	0·497
G	5·6	2·0	0·6	15·4	46·8	22·9	6·7	469	0·485
H	4·8	2·0	0·5	16·0	47·1	22·4	7·2	468	0·480
I	5·1	2·1	0·6	16·1	46·8	22·4	6·9	468	0·484
J	5·4	2·0	0·5	15·4	48·6	21·2	6·9	459	0·475
K	5·0	2·1	0·5	13·5	50·2	22·4	6·3	470	0·453
L	4·9	2·1	0·4	14·7	47·9	23·3	6·7	477	0·469
M	4·3	2·4	0·5	13·3	48·0	24·9	6·6	497	0·459
N	4·2	2·5	0·5	10·8	49·1	25·6	7·3	500	0·445
O	4·7	2·1	0·5	13·8	49·7	22·4	6·8	470	0·456
P	5·2	2·0	0·6	13·7	48·4	22·0	8·1	459	0·472
Q	4·0	2·4	0·6	12·6	51·1	23·0	6·3	482	0·437
R	4·4	2·1	0·4	16·3	48·0	22·2	6·6	473	0·470
S	4·7	2·0	0·6	15·4	47·9	22·4	7·0	467	0·472

Table VI. gives the results of routine tests for ammonia, cyanide, naphthalene, and sulphur.

TABLE VI.—*Routine Tests on Coal Gas Stream.*

Test.	NH_3 Passing Outlet Scrubber, Grains per 100 C.Ft.	Cyanide at Outlet of Rotary Washer Scrubber, Lbs. Sodium Ferrocyanide per 10,000 C.Ft.	Naphthalene at Outlet Meter, Grains per 100 C.Ft.	Sulphur at Outlet Meter, Grains per 100 C.Ft.
A	*Nil*	1·4	3·6	20·7
B	*Nil*	1·4	3·9	28·3
C	*Nil*	1·1	2·6	27·9
D	*Nil*	1·3	3·5	28·0
E	*Nil*	1·3	3·2	28·4
F	0·7	1·2	2·4	17·1
G	*Nil*	1·2	3·8	23·6
H	*Nil*	1·2	3·6	18·2
I	0·5	1·1	1·5	16·7
J	*Nil*	1·0	4·6	17·2
K	*Nil*	1·6	3·3	24·5
L	1·1	1·4	4·6	28·9
M	*Nil*	0·8	3·6	25·2
N	*Nil*	1·9	3·1	27·8
O	*Nil*	0·6	3·1	26·0
P	4·4	0·8	4·1	25·9
Q	3·4	0·6	4·1	27·0
R	1·3	0·7	3·8	17·0
S	*Nil*	1·0	1·9	20·1

Table VII. gives hourly analyses of the fuel gas during a complete typical 24-hours' operation of the producer. The open type step-grate producer as built with the Glover-West settings is admirable from the point of view of ease of operation; arduous manual labour being practically eliminated. In fact, the fires are only cleaned once in the 24 hours. As will be seen, the composition of the producer gas is excellent—due largely, no doubt, to the long periods between disturbances of the fire for cleaning purposes. With regard to the fuel consumption, regard must be had to the fact that we were using a greater amount of steam than usual, and that we were working for maximum make of gas per ton rather than for maximum make per retort.

It may also be remarked that high fuel consumption is not so serious, either, when efficient waste-heat recovery plant is available. For every pound of fuel fed to the producers, at least 4 lbs. of steam is generated for works purposes, saving at least ⅔ lb. of fuel. In other words, from the point of view of coke consumed on the works, a nominal fuel consumption in the producers of 15 lbs. of coke per 100 lbs. of coal carbonized can be reduced to a net fuel requirement of 5 p.ct. or (say) 1 cwt. of coke per ton of coal carbonized.

TABLE VII.—*Typical 24-Hour Test of Producer Gas.*

[Constituent Gases, P.Ct.]

Time.	CO_2.	O_2.	CO.	H_2.	CH_4.	N_2.	Calorific Value. Calculated.
10 15 a.m.	3·5	0·1	30·9	5·2	1·3	59·0	128 B.Th.U.
11.15 ,,	3·5	0·1	31·0	5·2	1·2	59·0	128 ,,
noon.	Fire clinkered and producer charged.						
12.15 p.m.	13·5	0·3	16·2	5·6	1·0	63·4	79 ,,
1.15 ,,	12·6	0·3	17·3	5·5	1·0	63·4	82 ,,
2.15 ,,	10·0	0·2	21·1	5·6	1·1	62·0	96 ,,
3 15 ,,	8·9	0·2	23·9	6·0	1·3	59·7	108 ,,
	Producer charged.						
4 15 ,,	6·4	0·2	26·8	6·6	1·3	58·7	119 ,,
5.15 ,,	4·2	0·2	29·8	6·6	1·2	58·0	128 ,,
6.15 ,,	3·5	0·2	30·7	6·6	1·2	57·8	131 ,,
7.15 ,,	2·6	0·2	32·3	6·5	1·3	57·1	136 ,,
	Producer charged.						
8.15 ,,	3·0	0·2	31·3	6·6	1·2	57·7	132 ,,
9.15 ,,	3·5	0·3	30·6	6·6	1·3	57·7	131 ,,
10.15 ,,	3·7	0·3	30·0	6·6	1·3	58·1	129 ,,
	Producer charged.						
11.15 ,,	4·0	0·2	29·8	6·6	1·3	58·1	129 ,,
12.15 a.m.	3·5	0·2	30·6	6·6	1·3	57·8	131 ,,
1.15 ,,	3·0	0·2	31·0	6·6	1·3	57·9	133 ,,
2.15 ,,	2·5	0·2	31·3	6·6	1·3	58·1	133 ,,
	Producer charged.						
3.15 ,,	3·0	0·2	31·3	6·5	1·3	57·7	133 ,,
4.15 ,,	2·6	0·2	32·0	6·5	1·2	57·5	134 ,,
5.15 ,,	2·5	0·2	31·6	6·5	1·2	58·0	133 ,,
6.15 ,,	2·5	0·3	31·8	6·5	1·2	57·7	134 ,,
7.15 ,,	3·0	0·2	31·3	6·5	1·2	57·8	132 ,,
	Producer charged.						
8.15 ,,	2·7	0·2	31·4	6·5	1·2	58·0	134 ,,
9.15 ,,	2·8	0·2	31·7	6.5	1·2	57·6	133 ,,
Average .	4·6	0·21	29 0	6·3	1·2	58 65	124 B.Th.U.

The typical waste gas analysis is as follows:

CO_2	17·80 p.ct.
O_2	2·10 ,,
CO, H_2, N_2	80·10 ,,
	100·00 p.ct.

CONCLUSION.

The results of the tests which have been laid before you illustrate in a striking way the immense difference between different coals as treated in the continuous vertical retort. One still hears it said that it is necessary to select coals for treatment in continuous verticals. Such statements show a complete misunderstanding of the real position. The real fact is that continuous verticals bring out differences in coals which would pass practically unobserved in any form of intermittent carbonizing plant. The intermittent plant, whether in the form of horizontal retorts, coke ovens, or vertical retorts or chambers, is essentially a rigid system in which the charge remains for a definite period. It is not easily possible to vary the period of carbonization. In continuous verticals, however, the carbonizing conditions can be adjusted to the requirements of the coal with an ease and a certainty which is quite beyond the possibilities of any intermittent system. There is a revival in some quarters of the intermittent vertical retort or chamber in which the charge of coke is steamed for a period after carbonization is complete; but this method is crude indeed compared with the nicety of adjustment of steam to the properties of the coal and the quality of gas which is to be produced in the continuous vertical.

Our plant has been used practically as a coal testing plant during the period under review, and we have never experienced the slightest difficulty in changing-over from one coal to another—ranging from slacks and nuts from Staffordshire, Derbyshire, Yorkshire, and North Wales. I trust the information will be of interest and value to members of this Association.

Discussion.

The PRESIDENT (Mr. W. G. S. Cranmer) expressed the indebtedness of the members to Mr. Poulson for coming forward with so interesting a paper. It must have entailed an enormous amount of work, which appeared to have been remarkably well done. Personally, he must confess to feeling rather envious when he looked at some of the figures relating to therms per ton. He was particularly interested in Mr. Poulson's make of 97¼ therms of 500 B.Th.U. gas per ton of Yorkshire washed gas nuts. It was a wonderful result; and it certainly made him feel that, if the time ever came when he reduced his own calorific value to 500 B.Th.U., and it became necessary to instal additional carbonizing plant or to reconstruct that already at work, and if the results mentioned in the paper could be maintained, he would be much inclined to recommend the adoption of a similar plant. When considering the erection of vertical retorts, however, it was necessary to bear in mind the question of coke. Vertical retort coke was not always so saleable as horizontal retort coke, though he knew that it depended upon the district.

Mr. BRIGGS said he did not profess to be in a position to analyze the whole of the voluminous statistics included in the paper. It would require a great deal of investigation finally to determine whether there was any loophole for error. He congratulated Mr. Poulson upon his really marvellous results, and upon the modesty with which he had put them forward. All this work apparently had been done since April, 1927, and when he realized the immensity of the task, he wondered how the author had ever found time to sleep. One must remember that Oldbury had a comparatively small works, so that Mr. Poulson could not possess a very large staff; and the enormous number of tests and analyses must have involved close application and careful watching of the plant. At the same time the output of gas had been increasing at a rate of something like 10 p.ct. per annum, which meant a large amount of managerial work as well.

HEAVY STEAMING.

To his (Mr. Briggs's) mind, the outstanding feature of the paper was the very heavy steaming which had been taking place; and based upon the results obtained, it would appear to be a paying proposition. Yet, on the other hand, one doubted whether, on a total balance, this particularly heavy steaming was an advantage. The steam used was over 30 p.ct., which he thought was more than the majority of them ever applied. The author mentioned particularly weak ammoniacal liquor, which he attributed to the method of working-up; but one did feel that a good deal of the steam had passed undecomposed, and had resulted in the weak liquor. What effect (if any) had it had on the ascension pipes and mains? The manufacturers of the plant had always told him that excessive steaming did produce a certain effect, which he did not invariably agree with. It was stated that the calorific values of the coal gas, as made, were indicated on a "Sigma" instrument, and those of the town gas were recorded continuously on a Beasley recorder; both these instruments being frequently checked by means of a standard Boys calorimeter. By "frequently," he presumed the author meant once a day. One could not find much fault with the method of testing. He would like to have the opinion of Mr. Poulson as to the "Sigma" instrument. His own experience was that it was erratic, and for tests was not to be relied upon too closely. The coal tests furnished some very high volatile figures. The author had adopted a method of analysis somewhat different from his (the speaker's); but it seemed that the coals were all extremely good, judging by the volatile content. In view of the heavy steaming and the high volatile coal, he had been looking into the matter from the point of view of the volatile matter in the coke. In Test N, he saw that the volatile matter in the coal was 34·6 p.ct., and that 500 B.Th.U. gas was being made. Yet in the gas there was only 10·8 p.ct. of CO, and the volatile matter in the coke was 0·53 p.ct. These figures struck him as being rather remarkable. He would have expected, with such a coal, with that amount of steaming and making that quality of gas, to have found a higher volatile content in the coke.

EFFECT ON THE FIRE OF CLINKERING.

The figures relating to the test of producer gas were particularly interesting to him, as he had the same type of plant. It seemed peculiar that the fire, after it was clinkered, should have given such bad gas. This went to show what an enormous effect the disturbance of the furnace had on the producer gas. The gas immediately preceding clinkering seemed so good that, on first thoughts, one might feel inclined to ask: "Why clinker at all?" But no doubt the question of the volume of gas available came in here. He congratulated the author upon his careful work, upon the great amount of labour he must have put into the paper, and upon the excellent results he had obtained from fuels which were familiar to them in the Midlands.

450 B.TH.U. GAS NEAR THE LIMIT.

Mr. HUBERT POOLEY (Leicester), referring to the test of Coal H as being the most remarkable of the whole series, said he envied Mr. Poulson's production of 116 therms per ton. Some day, perhaps, they would get over 200 therms from their coal. In his everyday working, however, he was really thankful if he obtained over 80 therms with mixed coals, chiefly from Derbyshire, in a plant similar to that of the author. He believed that Mr. Poulson had obtained these figures in a genuine way; but he also believed that, to obtain 450 B.Th.U. gas in extended practice, some of the figures were impossible. It might be that they would get down to 200 B.Th.U. gas; but he hoped this time was far distant. ["Hear, hear."] He thought that if they kept to 450 B.Th.U. gas they would be very near the limit at which the consumer would be truly satisfied. If they got below 400 B.Th.U., he believed the consumer was not satisfied. This was the fault of their existing distributing systems, which they could not change fast enough to meet the advance in production methods.

DRY VERTICAL RETORT COKE THE FINEST SMOKELESS FUEL.

He must differ from the previous speaker in the opinion he had expressed with regard to vertical retort coke. He had been making it since 1914; and he had had to take the greatest care not to put it on the general market, because then the general market would have demanded nothing else—the difference was so marked. When sold dry—and they did this at times at Leicester [laughter]—it was the very finest smokeless fuel that could be obtained, particularly if care had been exercised in the purchase of the coal. All the author's figures in Test H were exceedingly good; but the coke obtained in nearly all the results would not be borne out in practice. Vertical retort coke deteriorated so much on storing, that he was quite certain Mr. Poulson would agree that the larger gradings could not be sold in the proportions given in the analysis. The loss due to breeze making with vertical retort coke was very considerable, if one was compelled to store for long periods.

STRIKING FEATURES OF THE FIGURES.

Mr. P. N. LANGFORD (Coventry) remarked that the paper brought out very clearly the difference in the thermal yields of various fuels. He was struck by a comparison of Tests S and N. Both yielded

practically the same volume of gas, but of widely different calorific values. Another thing that had struck him, when looking through the analyses of coal, was, in most cases, the extraordinarily low ash content. It made one wonder whether this had not a very great bearing upon the thermal production from such coals. Then, again, turning to the analysis of the producer gas, it would be seen that over the twenty-four hours, with the exception of the first four hours after clinkering, the percentage of CO was practically the theoretical figure which would be obtainable with pure carbon and oxygen. He noticed, also, that this high percentage of CO was maintained right up to the time of clinkering. It rather looked as though there was no necessity to clinker; but presumably the reason was that the volume of producer gas had diminished. Certainly it was an extraordinarily high figure. There, again, the low ash content might have some bearing. Of course, from a carbonizing point of view, it was ideal to have one coal only, though it was not practicable, neither would it be prudent. He used at his works about twenty kinds of coal; and their average returns were about 82 therms, taken over a period of twelve months. This was with the 50 cwt. retort. He had just started-up five beds of 40-in. ones, like Mr. Poulson's; but so far he had been unable to divide the gas streams, so that he had no figures to compare with the 50 cwt. retorts.

A Difficulty of Large Works.

Mr. E. B. Tomlinson (Birmingham), referring to the coke analyses, remarked that 1 p.ct. of moisture was somewhat low; and he was wondering whether the coke was quenched by water spray in the bottom of boxes, or by the steam admitted for making water gas. He referred to the extraordinarily large number of therms represented by some of the analyses. As to the fuel used in the producers for the raising of this extra steam, he said that naturally there was a balance-sheet that should be determined with regard to the extra cost of putting in other boilers and using lower grade fuel, as compared with employing coke in the producers for the raising of the additional steam. Of course, they were very jealous of some of the results that had been obtained. In any of the larger works, they probably never had a less number of coals to carbonize in a single week than fifteen or twenty kinds; and they never knew to what extent their results were interfered with and masked by disagreement in working between these various kinds of coal. Thus such works, as they could not be limited to one coal at a time, were always up against difficulties. At the same time, they must all be intensely interested in the figures which the author had placed before them in Table I.

Steaming and Condensing Capacity.

Mr. C. H. Webb (Stourbridge) inquired what was the reason for putting in a second waste-heat boiler. Was it as a spare, or was there sufficient waste heat to require two boilers? He had been rather surprised to hear Mr. Briggs say that the "Sigma" did not strike him as being a very reliable instrument. He himself had obtained excellent results over a long period with the "Sigma." In fact, rather better than with other makes they had. In his case, the fires were attended to six times a day. They had found that, with steaming, as they did, to 460 B.Th.U., there was a considerable amount of latent steam which went forward to the condensers; and this might lead to further expenditure on condensing plant. The question of which coke was the more readily disposed of depended entirely, of course, upon the particular district. For household purposes and general utility, vertical retort coke was second to none. But there were certain trades for which it might be that horizontal coke was more suitable. Vertical retort coke was very dry; whereas horizontal retort coke, telpher quenched, was often far from being so.

Relation of Number of Therms to the Repair Bill.

With reference to the therms obtainable, one could, he thought, secure any number desired per ton of coal, from 80 to 110; but there was a relation to that in the amount of the repair bill. If one desired to go on year after year with a reasonable repair bill and a long life for the vertical retorts, he did not think one could expect more than from 80 to 85 therms per ton. He had been running vertical retorts of a different make from those referred to in the paper for over six years; and he had obtained every month in that six years over 80 therms per ton. He had done nothing in the way of repairs except pointing and washing at every opportunity and re-setting the top 3 ft. of the retorts. He thought they would have a further four or five years' run without any substantial bill for household repairs. This was the crux of the whole matter. He quite agreed that vertical retorts would treat any coal taken singly over a period; but mixtures, and mixtures in varying proportions, must be such as would conform more or less with the standard to which one was working at the moment. To this end, it was necessary to select the coals for treatment.

Mr. A. S. Foster (Stourport) said he would be glad to learn something further about the "Lava" bricks.

Consumers Will Have Vertical Retort Coke.

Mr. C. M. D. Belton (Shrewsbury) asked what was the actual strength of the liquor as made, because in his table the author had reduced it to terms of 10 oz. strength. One would like to know how much liquor he had to deal with. How did Mr. Poulson manage to get the same average figure for his combustion chamber temperatures? It seemed to him that it was probably more or less an estimated figure. One naturally aimed at keeping temperatures somewhat alike for similar mixtures or the same coal; but apparently those of the author had been kept constant for the whole of the time. Other figures were also the same within a degree or two. As to coke, he was with those who disagreed with Mr. Cranmer. His own trouble—as he gathered was the case with some other engineers—was that, when there was any other coke for sale, there was difficulty in getting rid of it.

Mr. J. P. McCrae (Derby) said he could not understand why a gas engineer should use an electric motor to drive the fan on his waste-heat boiler, if he could attain the same end with a turbine. If the author could make his run five years under the conditions set forth, he (Mr. McCrae) would be glad to know what particular material he was using in the way of silica. As to dampers on vertical installations, what was the general experience of engineers? He had found dampers that gave trouble; and he would like to know if there was one that could be moved easily after (say) six months' working. With reference to the temperature of ammoniacal liquor, he had found that the actual temperature in the storage well was round about 120° Fahr., and as they had to move a great deal of liquor in tanks, the police were often "on their track." He wondered whether the author had had any trouble in this respect, and, if so, what means he had adopted to overcome it.

Mr. W. C. Goodchild (Derby) raised the question of what was meant by the statement that "the gas yield per ton of 82 therms at 470 B.Th.U. is, of course, considerably better than the 85 therms at about 440 B.Th.U." obtained in another test.

Questions Answered.

Mr. Poulson, replying to the points that had been raised, said it was a peculiar thing that firms in Oldbury were prepared to buy vertical retort coke, even though horizontal retort coke was offered from outside sources at shillings per ton less than the Gas Department charged as a fair value for their vertical retort coke. The vertical retort made excellent coke from many points of view. It would appear that the porosity of the coke from vertical retorts went a great way towards compensating for the loss of volatile matter. They had had no ill-effects at all on their ascension pipes from the steaming. They were just slightly tarred. Trouble in ascension pipes was very often due to the amount of dust that was in the coal, and which was mechanically conveyed by the gas into the ascension pipe, where it gave rise to difficulty. The coals he had used had been washed coals, free from dust, and in this way they eliminated the possibility of trouble in the ascension pipes. The "Sigma" instrument was good and reliable.

The volatile matter in the coals was rather high, and the ash content low; and he submitted that it was due to a combination of these two factors that they were able to show the results which had been secured at Oldbury. There was another factor, and that was the matter of the conversion of the steam into water gas in its passage through the retort; and he would say that the coke from the Derbyshire coal was very active in this respect. In the case of Test H, where a very high thermal yield was shown, it was highly probable that the reactivity of the coke was in large measure responsible for this. The Yorkshire coals, of course, were very high in volatile matter, and gave a good percentage of hydrocarbons, which assisted in giving the high thermal yields. He suggested that this was a very useful coal for anyone who desired to keep on the 500 B.Th.U. line, or above it. Mr. Briggs had rightly pointed out that the CO_2 content of the furnace gases was high within a period of two hours after cleaning; but, of course, the fire was not cleaned in any less time than one-and-a-half hours, which would account for this high CO_2 content for the two hours following the commencement of the operation.

The figures relating to the quantity of coke for sale were rather good; and they were helped by the fact that they used breeze in their producers to the greatest extent possible, so as to leave the larger coke available for sale. Mr. Tomlinson had observed that the percentage of moisture in the coke was low. This was due to the use of high-temperature steam as the medium for cooling the coke. They had deemed it advisable to instal a stand-by waste-heat boiler, because they were dispensing with the old horizontal boilers. No trouble had been experienced in working; but considering that it was a mechanical proposition, assurance of spare power in case of breakdown was essential. His vertical retorts had been in for four years, and were still in excellent condition, and working at the temperatures indicated in the paper.

"Lava" Bricks.

With reference to the inquiry as to the "Lava" bricks, he might say that this was a very interesting production. He believed that it was the only brick of its type in existence. The makers claimed that they had made the best possible use of purely British materials, to produce a brick which would stand-up to the weight of the retorts, and the abrasive action of the charge, without slagging, spalling, shrinking, or wasting. The under-load test of this brick gave a result a great deal higher than all semi-silica, and as high as many pure silica, bricks. It withstood the fluxing action of coal ash slags very much better than other fireclay and silica refractories. Being fired to a very high temperature, it was extremely hard and tough. He would not be at all surprised if this brick should prove to have solved the problem of refractories for vertical retorts. It was without doubt a big step forward.

The liquor was 6 to 7 oz. strength; and for the purposes of tabulation it was calculated out to 10 oz. The combustion chamber and other temperatures were certainly kept very constant. The temperatures of gas from the retort were average temperatures, and were practically constant throughout the tests. As to the use of electricity for the waste-heat boiler fan, he would point out that they were running their works now on the steam produced by the waste-heat boilers, and there would not have been sufficient available for a turbine for the fan. Therefore whatever might be said about a gas engineer putting electricity into his plant, it was in their case a direct economy, and for that reason was installed. In Oldbury the output of gas had increased at the rate of 10 p.ct. per annum for four years; and the electrical people admitted that the activities of the Gas Department had been the cause of their own failure in the directions of heating and cooking. The silica in the vertical retort settings was from Friden, Derbyshire, and was excellent material. With regard to the damper on the inlet side of the induced-draught fan of the boiler, this was three years old, and was quite satisfactory.

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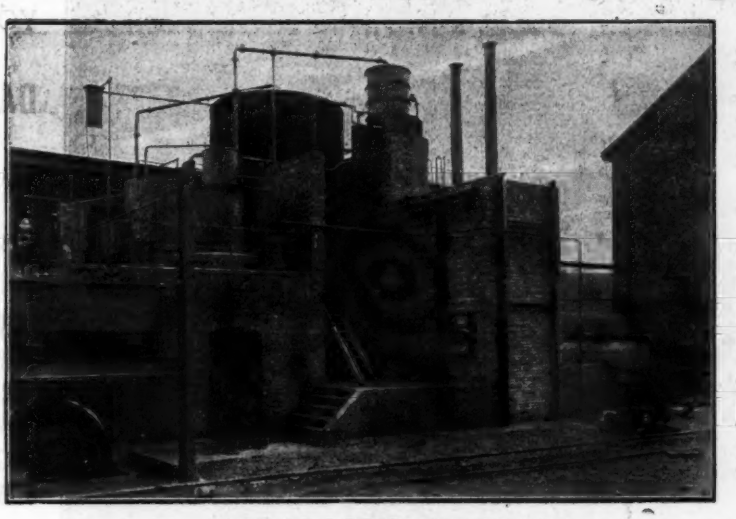

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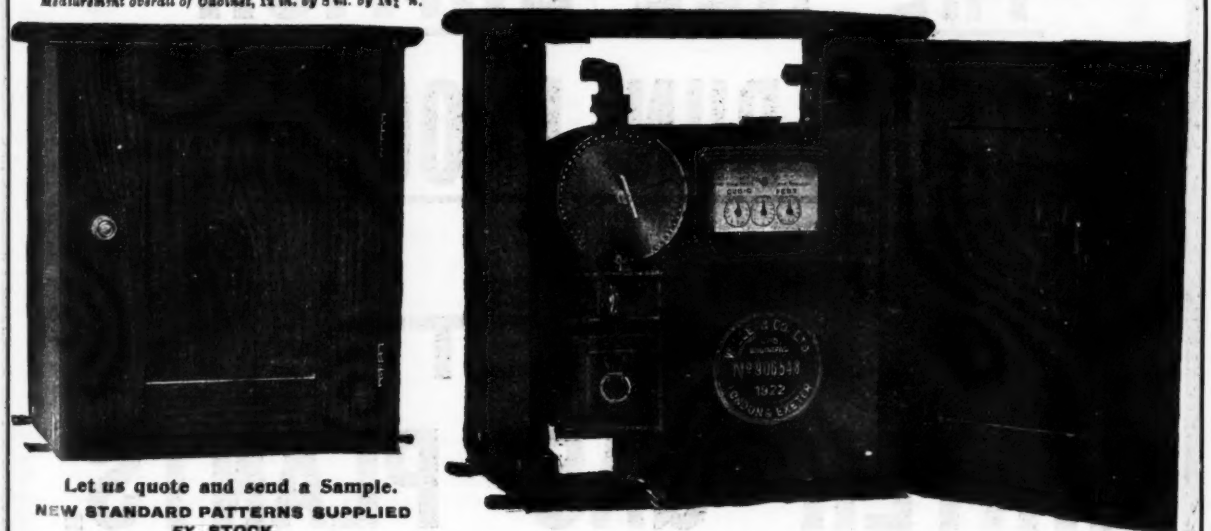

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REAVELL-ASKANIA REGULATORS.

The developments which have taken place in the last twenty years in the design and operation of coal carbonizing plant have been accompanied by a complete reversion of the previously accepted views on the relative importance of the control equipment of the plant, particularly with regard to the withdrawal of the gas from the ovens or retorts. The necessity for obtaining the highest possible yield of gas, coke, and the other products of the carbonization of coal, coupled with the equally important need for uniformity in their quality, renders it essential to employ the most sensitive governing devices obtainable, if the best possible use is to be made of our coal resources, and if the advances which have been made in carbonization practice are to be realized to the full. This point was emphasized during the recent Carbonization Conference held at the time of the British Industries Fair.

Messrs. Reavell & Co., Ltd., of Ipswich, have acquired the British Empire manufacturing rights for a control device known as the "Reavell-Askania" Regulator, which, while of extreme accuracy and sensitiveness, has ample power to operate the most heavy control valves, &c.—being of the hydraulic relay type.

The characteristic feature of the system is the relay which is shown in figs. 1 and 2. It consists of a pivoted oil jet known as a "jet-pipe," which is arranged to swing horizontally about a hollow perpendicular pivot through which oil under considerable pressure flows to the nozzle at the extreme end. The lower support is provided by a pin-point working in the conically recessed end of the vertical arm of the jet-pipe. Immediately facing the nozzle are two small adjacent orifices in the hard steel inset of the oil distributor, from which connections are made to either end of the control cylinder.

In the central position of the jet-pipe the oil stream impinges equally on both these orifices, and its velocity energy is almost completely converted into static pressure, which is the same at both orifices, and therefore on both sides of the piston in the control cylinder. If the jet-pipe is deflected to either

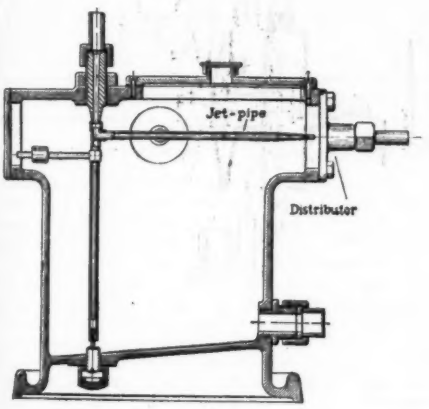

Fig. 1.

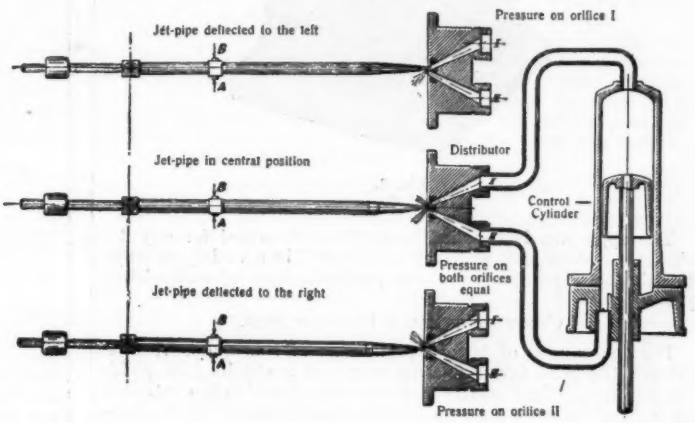

Fig. 2.

right or left, the pressure increases at one orifice and decreases at the other. There is therefore a pressure difference acting on the piston, which is set in motion at a speed dependent chiefly on the rate at which oil flows through the jet-pipe, and on the extent of the displacement.

The advantages of this form of relay are as follows:

(1) Since the jet-pipe is pivoted on a pin-point and the pressure lubricated taper oil inlet, there is no measurable friction.

(2) The maximum travel of the tip of the jet-pipe is one-twentieth of an inch from mid-position. The inertia effect is therefore infinitesimal.

The relay accordingly responds to the most minute fluctuations.

The design of the oil-pumping plant is varied to suit the requirements of the particular apparatus to be controlled. Fig. 3 shows the standard construction, which consists of a cast-iron pedestal enclosing the oil pump, driving motor, tank, &c.; the regulators being mounted above. The power consumption is approximately 0·5 kw.

When several regulators are installed at points somewhat removed from one another there are two alternative arrangements of the pump plant: (*a*) Several pedestal type plants, each carrying one or more regulators, may be installed in convenient positions near the control cylinders they are to operate. (*b*) A central type pump, driven electrically, by steam, or in any other desired manner, is arranged to supply all the regulators. Fig. 4 shows an external view of one of the several types of control cylinder employed. The crank drive incorporated in this type has the advantage that the ratio of valve movement to piston movement may be progressively decreased as the closed position is approached. Equal sensitiveness and accuracy of control are thereby obtained at small valve openings as at maximum flow.

As a Retort House Governor.

The relay is controlled by a suitable impulse system connected to the pressure or other valve it is required to regulate. Fig. 5 shows diagrammatically the arrangement of the "Reavell-Askania" low-pressure regulator connected as a retort house governor. The impulse system for this, and all low-pressure regulators, consists of a soft leather diaphragm F with aluminium stiffening plates, which controls the jet-pipe H through the rod G. Connection is made from a point A in the foul main between the control valve B and the retorts to the outside of the diaphragm. On the left-hand side of the jet-pipe is fitted an adjusting spring I, which produces a force that may be varied by altering the position of the plunger K.

Assuming that a slight pressure is to be maintained on the retorts, it is evident that any variation of pressure at A will cause movement of the jet-pipe. If, for instance, the pressure increases, the greater force on the diaphragm causes the jet-pipe to move to the left, so that oil passes to the left-hand end of the control cylinder M; the piston moving to the right, and opening the butterfly valve B. The exhauster is then able to draw the gas away, and the pressure returns to normal. Should the pressure fall, due to a decrease in the gas make, the reverse action occurs. The pressure maintained is adjusted by means of the plunger K. If the latter is pushed inwards, the regulated pressure increases, and *vice versa*.

To permit a range of adjustment between a given pressure and a given vacuum, a small counterspring is fitted on the outside of the diaphragm. The regulator will then maintain level gauge if desired; the plunger K being set at an intermediate position so that the counterspring is just balanced by the force due to the spring I. The usual range of adjustment for a retort house governor is from *plus* six-tenths to *minus* six-tenths of an inch W.G. With this range, the maximum permanent pressure variation is about 1/100th inch W.G.

For Tarry Gas.

Apart from its unusual sensitiveness, the "Reavell-Askania" regulator has the further advantage, when controlling coal gas and coke oven gas, that it has ample power to operate heavy butterfly valves in mains where considerable quantities of tar are present; and unless the regulator is out of operation for long periods, and the tar allowed to accumulate and harden, no trouble whatever is experienced in this respect. When the gas is abnormally tarry, or the tar is thicker than usual, it is desirable to instal the control valve in a vertical main, or alternatively to make suitable provision for preventing any undue accumulation of tar. In practically every case, however, it will be found that the accurate control over the pressure in the retort afforded by the "Reavell-Askania" regulator ensures that the tar is of good quality and is uniformly fluid; the formation of thick pitchy tar due to excessive draw on the retorts or ovens being entirely prevented.

For all cases where the gas is tarry or otherwise dirty, the

regulator and any instruments which may be installed are protected from injury and liability to stoppages due to accumulations of tar, &c., by a special device known as a protector hood. This consists of a liquid seal which functions as a non-return valve, and allows air or any other suitable chemically inert gas to pass into the impulse pipe at such a rate that it just diffuses slowly into the gas main, forming in the impulse pipe a gas "buffer" which, while transmitting the pressure, completely prevents the entry of foreign matter into the regulator and instruments.

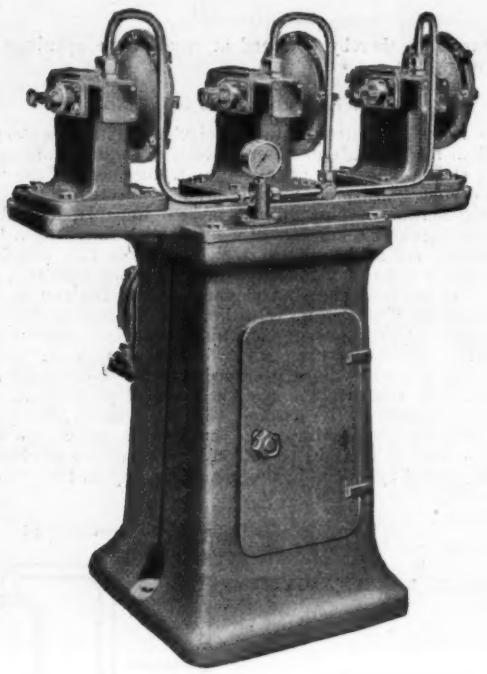

Fig. 3.

The apparatus is supplied in the form described for any desired pressure range, and may be installed in a variety of ways to suit the requirements of any particular type of carbonizing plant.

Control of Large Installations.

For the control of large installations of continuous vertical retorts, the most favourable arrangement is obtained by dividing the retorts into several groups, each of which is controlled by a separate governor. It is then possible to maintain absolutely uniform pressure conditions on every retort without employing unduly large foul mains, and once the best value has been determined, there is no need to vary the setting of the regulator. The same remarks apply to intermittent vertical retorts, provided that they are not charged according to a programme which results in undue "gluts" of gas from a number of adjacent retorts. With horizontal retorts, and in some cases with intermittent verticals, "gluts" of this type do occur, and it is necessary to alter the regulator setting from time to time to cope with this state of affairs. The "Reavell-Askania" regulator may be supplied with provision for automatic variation of the setting by clockwork.

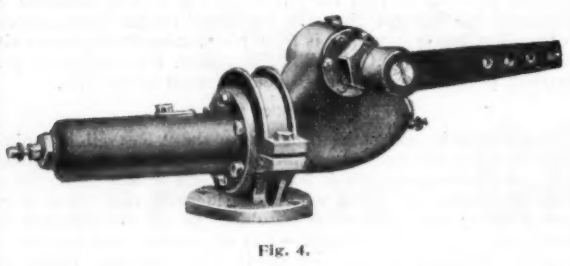

Fig. 4.

Complete control over the gas production is only possible when every retort or oven is provided with separate control, thereby preventing undue suction on those retorts whose charges are almost carbonized, and ensuring that the gas is freely withdrawn from the retorts during the early part of the carbonizing period, when otherwise the greater volume of gas has a tendency to cause back-pressure. This system has much to recommend it where large intermittent chamber ovens are installed in comparatively small numbers.

Exhauster Control.

The standard low-pressure regulator is also used for exhauster control. In this case, the impulse connection is made on the inside of the diaphragm, and is taken from the exhauster inlet connection. The regulator is arranged to control the draw of the exhauster by any of the following methods:

(*a*) Suction throttling.
(*b*) By-passing.
(*c*) Speed control by operating governing gear, steam throttle valve, shunt resistance, &c.
(*d*) A combination of (*c*) and either (*a*) or (*b*).

Methods (*a*) and (*b*), while very satisfactory from the regulation point of view, involve higher power consumption than speed control, which, on the other hand, has the drawback that the exhauster does not respond sufficiently rapidly to the regulator to correct small fluctuations with satisfactory accuracy, on account of its inertia. In those cases where both accurate regulation and economy of power are required, a combination of throttle and speed control offers considerable advantages, particularly in instances such as are met with on the majority of coke oven plants, where the control is normally carried out at the exhauster only.

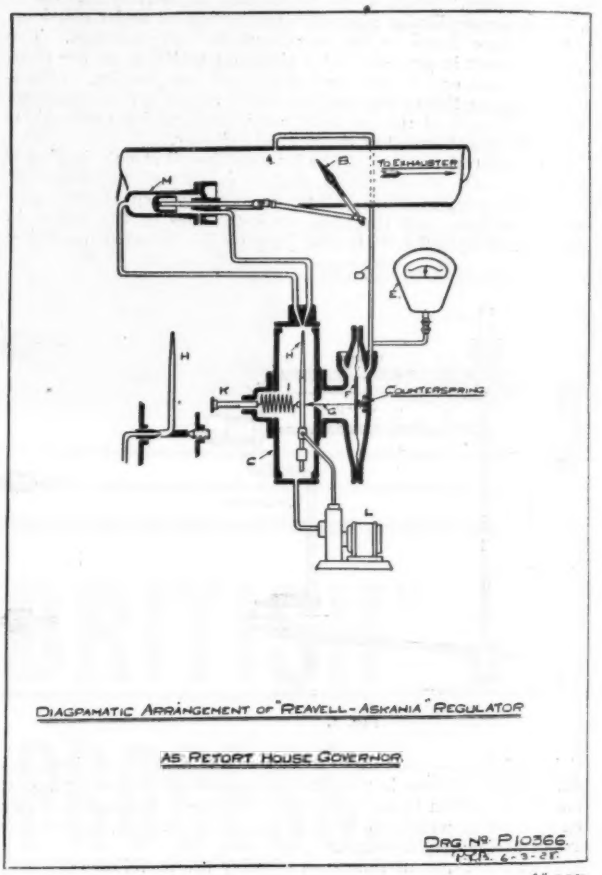

Fig. 5.

Fig. 6 shows diagrammatically the "Reavell-Askania" combined speed and by-pass or throttle control. The regulator 1 operates primarily on the cylinder 2, controlling the by-pass, which responds at once to any change in the pressure, and is normally nearly closed, passing only a small fraction of the total volume. Assuming that the gas quantity falls, causing the vacuum to increase, the control cylinder opens the by-pass, and at the same time operates a distributing valve which controls the supply of oil to the second cylinder 3, controlling the engine governing gear, or the shunt regulator in the case of a motor-driven plant. The engine or motor accordingly slows down, so that the vacuum is reduced, and will continue to do so until the by-pass and its cylinder have returned to their original positions and the distributing valve is again closed. The cylinder controlling the speed remains in its new position until a further change occurs. It is therefore clear that the permanent fluctuations are ultimately dealt with by speed control, and only very small or temporary fluctuations are corrected by the by-pass alone.

As the by-pass is nearly shut in its normal position, the economy obtained with this system is practically equal to that due to speed control; but the regulation is far more accurate. Moreover, since the operation of the speed regulating mechanism is under the control of the distributing valve connected to the by-pass control cylinder, it is impossible for the speed

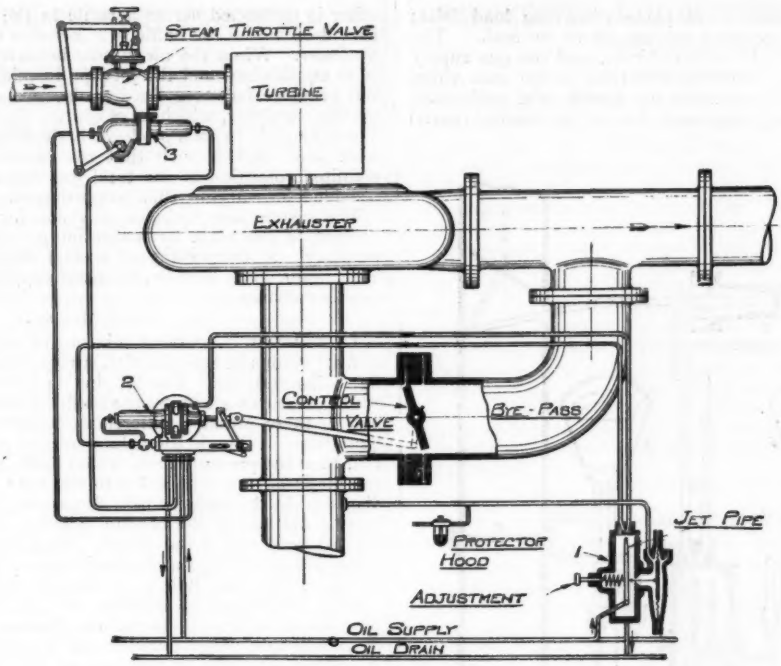

Fig. 6.

control to vary independently of the by-pass, which was a fault of some of the older combined speed and by-pass regulators.

It will be readily appreciated that this scheme may be arranged with the control valve in the main and the impulse connection made to the collecting main. In this form, the regulator is eminently suitable for coke oven plants; the draw at the exhauster inlet being so regulated that any desired pressure or suction is maintained on the ovens.

Other Applications to Gas-Works and Coke Ovens.

Other applications of the "Reavell-Askania" system to gas-works and coke ovens include regulation of the draught in the flues, and also of the heating gas supply in the case of coke ovens and of town gas plants provided with external producers.

The regulator may also be rearranged as a station or district governor; the pressure being automatically varied in accordance with the load. In this case the regulator is provided with two diaphragms, one of which is connected as for a constant pressure regulator, while the other is subjected to the differential pressure set up by the passage of the gas through a venturi pipe or a sharp-edged baffle. The characteristic obtained is of the form shown in fig. 7. Two adjustments are provided, one controlling the value of the no-load minimum pressure (p_1), and the other the ratio of the added pressure (p_2), at maximum load to the no-load pressure. This apparatus is entirely automatic in operation, while the adjustments enable the most favourable pressure conditions to be employed.

A further application of the "Reavell-Askania" regulator of interest to gas engineers is to the control of steam pressures for steaming vertical retorts, and for other similar applications. The leather diaphragm is in this case replaced by a Bourdon or spring tube, the remainder of the apparatus being the same as used for low pressures. In this form, the apparatus has a sensitiveness of from $\frac{1}{2}$ to $\frac{3}{4}$ p.ct.

Regulation of Gas Producer Plant.

The "Reavell-Askania" regulator is also applicable to the control of gas producers. Fig. 8 shows the gas generation regulator, which adapts the air supply to the requirements of the producer by throttling the air flow from the fan, so that the gas pressure is constant, irrespective of the demand. The regulator 6 receives its impulse from the crude gas main 1, and operates the cylinder 11 controlling the throttle valve 2. Assuming the gas demand to increase so that the pressure in the gas main falls, the force on the diaphragm 5 is decreased, and the jet-pipe moves to the right under the action of the spring. Oil under pressure therefore flows to the right-hand end of the control cylinder 11, which opens the butterfly valve and allows more air to flow to the producer, restoring the gas pressure to its normal value by increasing the generation of

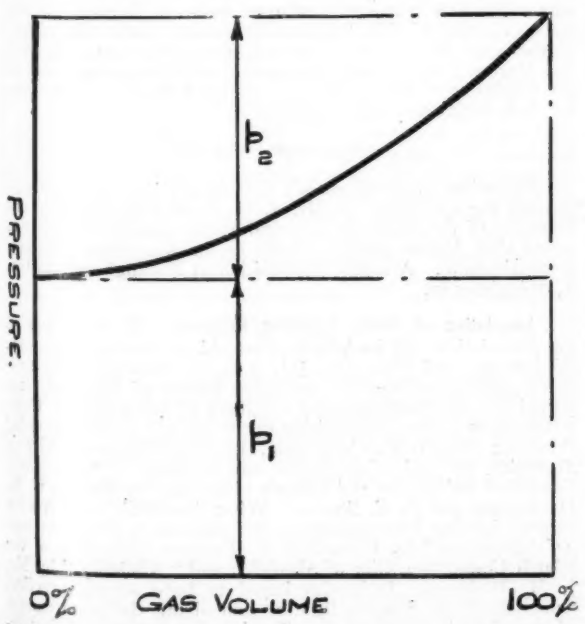

Fig. 7.

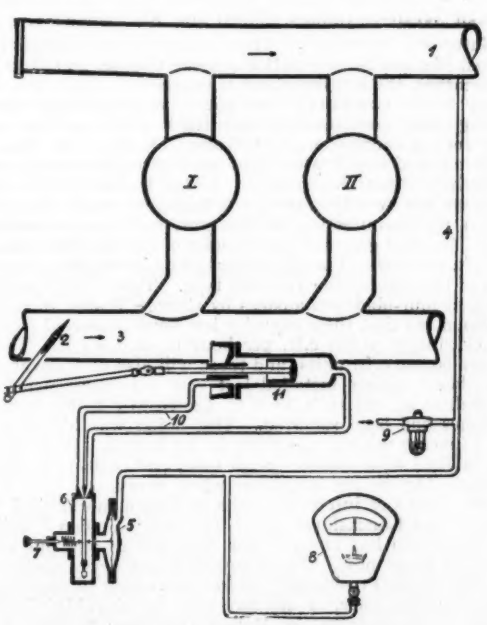

Fig. 8.

gas. The reverse action takes place when the load falls; the pressure otherwise tending to rise above normal. The pressure in the gas main is quite uniform, and the gas supply to the consumers under better control than is the case when hand regulation is relied on, while the quality and uniformity of the gas are appreciably improved, due to the steadier operation of the plant.

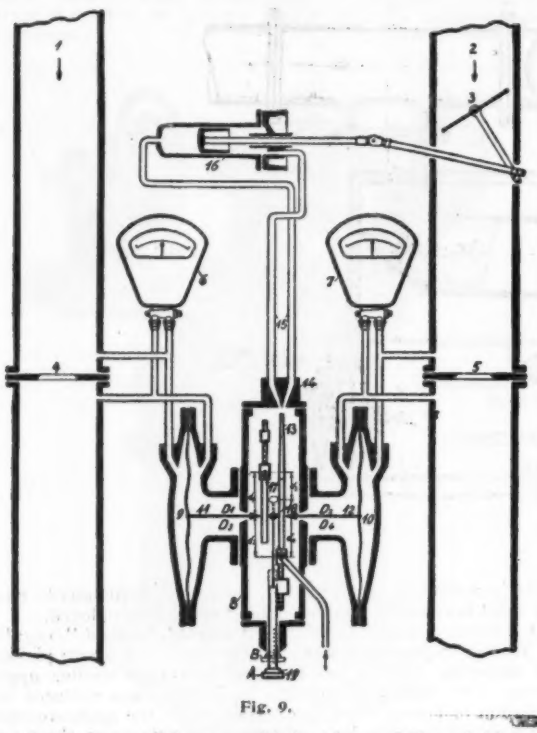

Fig. 9.

Producers in parallel are provided with regulation of this type, provision being also made to ensure that each producer takes its fair share of the load. The difficulty experienced with producers operating in parallel on varying load owing to varying thickness of fuel bed is completely overcome. The master regulator, which is connected to the crude gas main and operates on low-pressure air instead of oil, distributes an impulse pressure which is a measure of the load. Each producer is provided with a load regulator which controls a damper in the blast duct, and has two diaphragms, one of which is connected to the impulse pressure from the master regulator, while the other is connected across a baffle in the blast duct. The pressure drop across the baffle is a measure of the air supply to the producer. When the air supply is correct, so that the system is in equilibrium and the jet-pipe in mid-position, this differential pressure balances the impulse pressure distributed by the master regulator, which is, of course, the same for all producers. The air supply to each producer is therefore varied in accordance with load, and is such that the producer always supplies a definite proportion of the total gas demand. Adjustments are provided for varying this proportion as desired.

The system also includes provision for controlling the steam content of the blast by maintaining constant saturation temperature. A thermostat of special design is inserted in the blast main, and controls the steam supply, so that the temperature is constant.

Gas Mixing.

To maintain a constant mixture of two gases independently of fluctuations in the quantity, a regulator of the type shown in fig. 9 is employed. The jet-pipe 13 is controlled by the differential pressures set up by the baffles 4 and 5 in the gas mains 1 and 2, these pressure differences being a measure for the gas quantities. Should the volume of gas passing through main 1 fall, then the pressure drop across baffle 4 will become less, and the diaphragm 9 will move to the left; and the jet-pipe 13 is displaced in the same sense. Pressure oil will then pass to the right-hand end of the control cylinder 16, closing the valve 3, the left-hand end of the cylinder being unloaded.

Equilibrium is again obtained when the quantity of gas flowing in main 2 has fallen, so that the reduced differential pressure at diaphragm 10 balances that at diaphragm 9. The jet-pipe then returns to its central position. Since the pressure drops are both proportional to the square of the gas quantities, it follows that the proportions of the two gases remain the same. The proportions may be varied, if desired, by means of the adjustment 19. Instruments 6 and 7 indicate the gas quantities.

This system may be supplied to the mixing of any gases—such as coal gas and carburetted water gas, coke oven and blast furnace or producer gas, gases used in chemical processes, &c. Three gases may be mixed by employing a second regulator. It should be noted that the "Reavell-Askania" gas mixture regulator requires only one regulating valve, which is placed in the main carrying the secondary gas, the quantity of which is to be controlled in accordance with the variations in the primary gas, regulated by some external means.

Combustion Regulators for Gas Firing.

For this purpose, the mixture regulator is arranged to control the air supply to the burners so that the excess air ratio is maintained at any desired value, irrespective of fluctuations in the gas volume and pressure or in the draught. A CO_2 content closely approaching the theoretical for the particular gas being burned may be continuously maintained at all loads, providing the design of the burner and combustion chamber is suitable.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

On the invitation of the Kilmarnock Gas Committee, the Scottish Western Juniors visited the Kilmarnock Gas-Works on Saturday, March 24. The visitors were received by Ex-Provost Mathew Smith, O.B.E., Bailie Carnie, and Mr. Charles Fairweather, the Engineer and Manager.

A profitable two hours were spent on the works. The gas-making plant consists of intermittent verticals (four settings of 15 retorts each) erected by Robert Dempster & Sons, Ltd., of Elland, and also five settings (each of eight through retorts) of machine-stoked horizontals. Added to this within the last six years are two Humphreys & Glasgow water gas plants—one for the manufacture of blue gas, and one for carburetted gas. The total gas-making capacity of the plant exceeds 2 million c.ft. per day. The exhausters, four in number, were originally of the three-blade Laidlaw type. Two were recently converted to four-blade exhausters by George Waller & Son, Ltd., of Stroud, so that their capacity has been increased from what was originally 50,000 c.ft. per hour to 60,000 c.ft. The other two are 60,000 c.ft. units, and these will also be renovated soon. A washer scrubber installed last year was constructed within the shell of an old 25 ft. by 7 ft. Lancashire boiler from which the tubes had been removed. This boiler was placed upright, and a Livesey washer was fitted in the bottom. The rest of the shell is filled with boards, rough sawn and built-up in a chequer fashion. On the top is a water wheel spray.

Other items of interest are the Meldrum mechanical stokers fitted on the Lancashire boilers, and the "Vulcan" boiler flue cleaner, which has obviated the necessity of any flue cleaning for some years now. The tangential gas dryer spoken of by Mr. Fife in his Presidential Address was seen in operation.

During last year, a 400,000 c.ft. spiral-guided holder for water gas was erected by Robert Dempster & Sons, Ltd. It is fitted with "Elland" ball bearing carriages.

The visitors, under the Chairmanship of Ex-Provost Mathew Smith, were entertained at tea in the newly constructed Workers' Club house. This building has not yet been officially opened. The Chairman gave the visitors a cordial welcome, to which Mr. Fife (President), who is Assistant Engineer at Kilmarnock, replied. Mr. Fairweather gave an interesting résumé of the early history of the works, which dates back to 1822. Mr. Murray (Vice-President) complimented the management on the condition of the works, and thanked the Gas Committee for their invitation and hospitality.

Correction.—In last week's "Journal," in a notice concerning the retirement of Mr. J. H. Crowther, Engineer and Manager of the Wallasey Gas and Water Department, it was stated that, before going to Wallasey, he was Water Engineer at Nottingham. Actually, his position at Nottingham was that of draughtsman.

Association of Public Lighting Engineers.—A conference of the Association will be held in Sheffield on Monday, Tuesday, Wednesday, and Thursday, July 9 to 12. Members and delegates will be received by the Lord Mayor of Sheffield, supported by the Chairman and members of the Lighting Committee of that city. In addition to the Address by the incoming President (Mr. J. F. Colquhoun, Lighting Engineer, City of Sheffield), the following papers will be read: "Non-Manual Control of Public Gas and Electric Lighting," by Messrs. E. H. Horstmann and E. E. Sharp; "What the Public want from a Street Lighting Department, as Pedestrians, as Motorists, and as Ratepayers," by Councillor F. Thraves, Chairman of the Watch Committee, City of Sheffield; and "Visibility," by Mr. J. M. Waldram. It is also hoped to have several practical demonstrations of street lighting embodying the requirements of the British Standard Specification for Street Lighting recently issued by the British Engineering Standards Association.

COAL AND BYE-PRODUCT EXPORTS.

The export business in coal continues on the low scale, and the values received are not such as the coal industry would like to see. It is part of the object of the coal-selling schemes to conduct operations in the markets abroad with the view of developing demand. But other countries are watching with intense interest the plans of the British coal owners; and it is impossible to see that anything but a war in cut prices for coal is likely to ensue in respect of business overseas. For financing these operations, it is clear that the promoters of the coal-selling schemes intend that home consumers shall make the necessary provision—particularly the public utility industries, such as gas and electricity supply. It was remarked by a member of the House of Commons recently that the proposals look very much as though home industry would in effect be subsidizing industries abroad through the price of coal, which would be used for manufacturing purposes in competition with the products of our own industries.

Coal Exports.

The Board of Trade Returns for February show that 4,007,631 tons of coal were exported during the month, which compares with 4,172,856 tons in February, 1927, and 4,340,006 tons in February, 1926. The total value of the coal shipped abroad in the month was down to £3,152,273, which compares with £3,982,682 in February, 1927, and £4,025,627 in February, 1926. Of these quantities and values, gas coal represented in February 579,992 tons, the value of which was £432,061, which is equivalent to an average of 14s. 10·78d. per ton. The comparative figures were 519,938 tons in February, 1927, and 543,413 tons in February, 1926—the respective values being £453,215 and £438,309.

In the first two months of this year, the total coal exported was 7,912,331 tons, compared with 8,265,735 tons in February, 1927, and 8,488,048 tons in February, 1926. The values of these quantities were: 1928, £6,226,369; 1927, £8,273,488; 1926, £7,846,963. To these quantities and values, gas coal contributed in the two months 1,032,232 tons; in the corresponding period of 1927, 1,076,848 tons; and in that of 1926, 1,105,929 tons—the values being: 1928, £777,139; 1927, £980,331; 1926, £898,144.

Gas Coke.

The shipment of gas coke in February amounted to 88,984 tons; in February, 1927, 66,022 tons; and in February, 1926, 119,895 tons. The value of the gas coke exported in February was £94,027, which gives an average of £1 1s. 1·6d. per ton. The value for February, 1927, was £77,849; and February, 1926, £126,884.

Taking the first two months of the year, the total quantity of gas coke sold abroad was 224,860 tons; in the same period of 1927, 121,807 tons; and in that of 1926, 257,646 tons. The values were: 1928, £233,699; 1927, £146,182; 1926, £266,716.

Metallurgical coke appears to be having a somewhat better time. Business in February amounted to 116,802 tons, as compared with 32,725 tons in February, 1927, and 98,814 tons in the same month of 1926. The values were: 1928, £117,662; 1927, £51,951; 1926, £111,508. In the two months, the metallurgical coke sent abroad reached 241,098 tons, which compares with 55,069 tons in the same period of 1927, and 204,237 tons in that of 1926. The values of these quantities were: 1928, £239,905; 1927, £87,938; 1926, £229,883.

Tar Products.

Very little business is being done abroad in benzole and naphtha; but in regard to tar, oil, creosote, &c., the aggregate of exports in February was 2,862,657 gallons, which compares with the low figure of 282,987 gallons in February, 1927. In the two months of the year, 7,688,663 gallons were exported, as against 1,697,010 gallons in the same period of 1927.

Of coal tar pitch, in February 22,947 tons were sent abroad, as against 27,054 tons in February, 1927. In the two months of the year, 51,160 tons were disposed of overseas, compared with 48,539 tons in the same period of 1927.

Sulphate of Ammonia.

Business abroad in sulphate of ammonia amounted to 26,199 tons in February, as compared with 11,053 tons in February, 1927. In the first two months of this year, the total quantity exported was 54,400 tons, as against 19,567 tons in the corresponding period of 1927. In January-February, the Dutch East Indies took 16,196 tons, and Japan 16,226 tons; these being so far the best buyers.

Gas Oil Imports.

In February the amount of gas oil received was 13,597,782 gallons, as compared with 10,895,854 gallons in February, 1927. In the first two months of the year, 22,463,927 gallons were imported, as compared with 27,068,007 gallons in the same period of 1927.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Annual Dinner.

The Annual Dinner of the Association was held in Manchester on March 31, and was preceded by an informal discussion on unusual gas-works experiences, which was introduced by Mr. W. Buckley, of Manchester, and Mr. H. J. Hailstone, of Rochdale.

The afternoon was spent profitably. The problems mentioned by the authors brought forth a number of others, and revealed to the members many matters of which they were unaware.

At the conclusion, the thanks of the meeting were conveyed to the two gentlemen who had opened the discussion; the members taking part in the discussion being Messrs. Carter, Hodgson, Haynes, Singleton, and Bamber.

At the dinner, Mr. J. Terrace, Vice-President of The Institution of Gas Engineers, said that the Institution had a high regard for the work of the Junior Gas Associations. During the course of his remarks he made special reference to the Education Scheme—its birth, present work, and outlook—and the proposed Royal Charter and its probable effect on the profession generally.

Underground Oil in England.

Dr. Arthur Wade last evening read a paper before the Institute of Petroleum Technologists on the "Oil Well and Later Developments at Hardstoft, Derbyshire." It was largely a historical account of the success and failure of oil-well sinking in that area. It will be remembered that the first bore at Hardstoft, which was made under the Government Scheme for seeking oil in England, struck a fairly considerable supply of what was sought. Dr. Wade holds that, to come to the conclusion that this is the only large supply that exists or can possibly exist, would be absurd. It appears to him to be certain that accumulations of petroleum, possibly of comparatively large dimensions, remain to be discovered in England. The main problem is whether it would be a profitable business to seek for such accumulations; and this is where doubts now arise. That accumulations of oil are present in the Midlands, he is fully persuaded; but he is also sure that to look for them is not at present a commercial proposition. Some day—either when there is a dearth of fuels, or in certain cases of national emergency—the search for oil in England may be commenced again.

Iron and Steel Institute.—The annual meeting of the Institute will be held at the Institution of Civil Engineers on Thursday and Friday, May 3 and 4. Among the papers to be presented is one by Messrs. J. H. Jones, J. G. King, and F. S. Sinnatt on the "Reactivity of Coke."

Scottish Junior Gas Association (Eastern District).—In the report of the meeting at Cupar on March 17 (see "Journal" for March 28, p. 807), it was stated that, in the discussion on Mr. J. Scobie's paper on "The Use and Economy of a Soot Blower," Mr. McPherson asked whether any superheating arrangement was employed, and said that he used exhaust steam for the purpose. The word superheating should be pre-heating.

British Standard Tables of Pipe Flanges.—The British Engineering Standards Association have recently issued Part 1 of the revised Tables of Pipe Flanges, Publication No. 10, which, with Part 2 (Steam), published in 1926, completes the revision of the 1904 edition. Part 1 comprises the three Tables A, B, and C, which deal with flanges for pipes, valves, and fittings for gas and water. Dimensions are specified for pipes up to 72 in. nominal bore for working water pressures up to 50 lbs., and up to 48 in. nominal bore for working water pressures up to 130 lbs. and 175 lbs. per sq. in., respectively. The gas flanges are for working pressures up to 30 lbs. per sq. in. Copies of the Tables (No. 10, Part 1—1928) may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W. 1; price 2s. 2d., post free.

The "Warrior" Patent Label (Patent No. 269,743).—A tie-on label which it is practically impossible to tear off is one of the latest patents. The inventor is Mr. J. P. Vinall, of 2, Norfolk Street, Strand, W.C. The label is obtainable through the British Commercial Gas Association at reasonable prices—in fact, very low, considering that the labels are hand-made. Brentwood, Burton-on-Trent, Gosport, Halesowen, Ormskirk, and Southgate are among the gas undertakings who are "trying them out." For labelling gas cooker and fire parts, fittings, and the like, they are excellent, in addition to the usual service of delivery of goods. At the foot of the label useful advertising matter—"Gas for Heating, Lighting, Cooking, Power, and Hot Water"—is printed. The label is formed with non-rust reinforcing wires which are locked together within the label area. In practice a thin wire is doubled upon itself, the limbs being threaded through perforations, and one limb passed round the other to form a lock. The limbs are twisted together at the end of the label, leaving loose ends for attaching the label to an article.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Blending Coke with Coal.

Sir,—In your issue for Feb. 22, an abstract was given of a paper entitled "An Examination of the Influence of Various Factors on the Products of the Carbonization of Coal," by Mr. H. H. Thomas. Here the effect of blending coke with the coal is discussed. It may be of interest to contrast some results I obtained working on this question under similar conditions. I append these in brief.

Mixtures of a Durham coking coal with varying percentages of coke breeze were made up as detailed below. Charges of 2½ lbs. were carbonized to give a yield equivalent to 13,000 c.ft. per ton from the coal present in the mixture.

Details of mixtures:

Series A. . . Coal through ¾ in. *plus* coke breeze through ⅛ in. (10, 20, 30 p.ct. breeze).

Series B. . . Coal through ¾ in. *plus* coke breeze through ⅛ in. (10, 20, 30 p.ct. breeze).

Series C. . . Coal through ⅛ in. *plus* coke breeze through ⅛ in. (10, 20, 30 p.ct. breeze).

These mixtures in series B and C were then ground to pass a 60 mesh sieve. Results:

—	P.Ct. Coke Breeze (Air Dried Sample).	Time Equivalent to 13,000 C.Ft. of Gas per Ton of Coal.	P.Ct. Increase in Rate of Carbonization.	Coke Yield on Mixture, Cwt. per Ton.	Coke Hardness,* P.Ct. on Mixture.	Calorific Value on Mixture, B.Th.U.
		Min.				
Series A	*Nil*	35½	..	14·0	85·0	542
Mean of three charges	10	33	7·0	14 15	73·8	554
	20	31	12·6	14·8	56·7	565
	30	29½	17 0	15·7	36·9	549
Series B	10	32	9·8	14·3	75·7	549
Mean of two charges	20	30	15·5	14·8	70·1	548
	30	27½	22·5	15·4	53·1	554
Series C	*Nil*	36½	..	14·3	87·0	554
Mean of two charges	10	32½	12·3	14·6	83·0	547
	20	28½	22·0	15·4	74 0	549
	30	28	23·0	15·7	68·2	557

* P.Ct. retained on ⅛ in. after a drum abrasion test on the coke graded between 1 in. and ½ in.

The following notes were made on a visual examination of the coke:

Series A: Coherency drops very quickly as percentage of coke breeze increases. The 30 p.ct. mixture crumbles away easily. Contraction slightly diminished, and swelling of upper surface appreciably diminished with 30 p.ct. mixture. The latter fractures, with the production of much dust.

Series B: Internal "pipe" diminished, especially with 30 p.ct. breeze. Surface swelling further decreased. Coke more coherent compared with series A, but radial cracks are prominent. The coke is easily split in a longitudinal direction.

Series C: Remarkable in that no volume change occurs, and internal "pipe" is almost eliminated, especially towards ends of the charge. Radial cracks still show, however. The cokes fracture into nuts without the production of dust.

Taking the above results as a whole, it would appear that the most practicable blending operation to give the best results on a large scale would be to grind both coal and breeze together to about $\frac{1}{16}$ in. or less, keeping the proportion of coke breeze between 10 and 15 p.ct. With caking coals yielding cokes inferior to the above, the advantage of blending would be accentuated.

In the paper referred to it is stated that "the thermal yield was the same as that obtained with the coal carbonized alone," but here carbonization has been prolonged until the curves become horizontal, giving "an increased yield of gas (calculated per ton of coal in the charge) of reduced calorific value." With the Durham coal, however, an increase seems probable if carbonization is continued only until the yield of gas is the same as for the unblended coal.

It would appear that the statement "decreasing the size of the coal (curve 5) reduces the rate of carbonization" requires modification in the case of fine grinding in. This is well illustrated by comparing series B and C with series A. The influence of fine grinding in causing a discontinuity of the plastic layer is more powerful than the "size" effect.

I am indebted to Mr. Frank P. Tarratt, of the Newcastle and Gateshead Gas Company, for permission to publish these data.

J. B. Chapman, B.Sc. (Eng.),
Chemical and Engineering Staff.

Gas-Works,
Tyneside Road,
Newcastle-upon-Tyne,
March 29, 1928.

Price of Gas at Whitby.—The price of gas will be reduced by the Whitby Gas Company from 5s. 6d. to 5s. 3d. per 1000 c.ft. after the reading of meters for the quarter ended March 31, and not, as stated in the last issue of the "Journal," from 5s. to 4s. 9d. per 1000 c.ft.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Coventry Corporation and South Metropolitan Gas Bills: Brought from the Commons; read the first time; and referred to the Examiners.

Barnet District Gas and Water Bill: Reported, with amendments.

Hemel Hempsted District Gas Order: Referred to the Special Orders Committee.

Littlehampton Gas Order: Approved.

HOUSE OF COMMONS.

Progress of Bills.

Coventry Corporation and South Metropolitan Gas Bills: Read the third time, and passed.

Hemel Hempsted District Gas Order: Copy presented.

Llandudno Urban District Council Bill: As amended, considered; read the third time, and passed.

Low-Temperature Carbonization.

Mr. Grenfell asked the Secretary for Mines whether he could give the details of results in low-temperature carbonization plants operating in this country, showing the amount of raw coal treated each week, with the quantities of oil, gas, and carbon residue in plants working on a commercial scale.

Commodore King stated, in reply, that statistical information as to the amount of coal now being treated by low-temperature carbonization methods was not available. Technical results of plants that had been tested by the Director of Fuel Research were given in published reports.

Mr. C. P. Williams asked the Secretary for Mines whether tests had been carried out on behalf of his Department on the low-temperature carbonization of North Wales coal; if so, what was the yield of tar oils obtained?

The Secretary for Mines (Commodore Douglas King) replied that no tests had as yet been carried out on the low-temperature carbonization of North Wales coal.

Mr. George Hall asked (1) whether details could be given of results of tests carried out at the Fuel Research Station on the low-temperature carbonization of coal from the Somerset coalfield; the names of the collieries from which the coal was obtained, with the yield of oils, gas, and carbon residue obtained from each ton of coal treated; and whether similar details could be given for the South Wales coalfield.

Commodore King: The results of tests of low-temperature carbonization of coals from various coalfields were published from time to time by the Department of Scientific and Industrial Research. The laboratory results already published for South Wales coals would be found in Technical Papers Nos. 1 and 10 of the Fuel Research Board, which should be read in the light of information contained in the Report of the Fuel Research Board for the years 1920-1921, Second Section. Some large-scale results for a South Wales coal were contained in a report by the Director of Fuel Research on the Freeman Multiple Retort. The results of large-scale tests of a Somerset coal were being prepared for publication. No summary of the results of such tests could be given without technical particulars of the kind contained in these reports, since such particulars were necessary for the correct interpretation of the results.

APPLICATIONS FOR PATENTS.

Nos. 7517—8223.

Bingham, J. H.—"Gas meters." No. 7733.

Davidson, W. B.—"Distillation of tar oils." No. 7887.

Glover & Co., Ltd., G.—See Bingham, J. H. No. 7733.

Green, R. W.—"Machine for discharging residue from retorts." No. 7532.

Gross, O.—"Method of gasifying coal, coke, &c." No. 7993.

Humphreys & Glasgow, Ltd.—"Automatic oil control for carburetted water gas machines." No. 8077.

Kilburn, B. E. D.—"Installations for dry cooling coke." No. 7698.

Mickie, A. C.—See Davidson, W. B. No. 7887.

Muddiman, E. W.—See Davidson, W. B. No. 7887.

Sulzer Freres Soc, Anon.—See Kilburn, B. E. D. No. 7698.

Thompson, A.—"Gas burner." No. 7679.

Woodcock, B.—"Distillation and decarbonization of coal, &c." No. 7658.

Italian Import Duty on Coke.—It is stated in the "Iron and Coal Trades Review" that, under a recent Government order, a duty of 3 gold lire (about 2s. 6d.) per metric ton will have to be paid on imported coke, which hitherto has been allowed to enter Italy free of duty.

Good Results at Exmouth.—Satisfaction was expressed by Mr. E. T. Linscott, Chairman of the Exmouth Gas Company, at the annual meeting on March 26, that the progressive policy adopted had enabled the Directors to reduce the price of gas and at the same time to recommend an increase of dividend on the ordinary stock of the Company; the rate recommended being 7½ p.ct., as against 7 p.ct. last year. The report stated that sales of gas showed an increase of upwards of 8¾ million c.ft., or 44,243 therms, over 1926; this increase being equal to 8 p.ct. The Directors had decided to reduce the price by ½d. per therm.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held on March 28—Mr. Francis J. Dickins, J.P., the Chairman, presiding.

The Chairman, in moving the adoption of the report and statement of accounts, said that their sales of gas in 1927 were greater than in 1926 by 9·1 p.ct., and greater than in 1925 by 25 p.ct. The increase in 1927 was greater than the total annual output of the Dublin Corporation electricity undertaking. The Company's annual output represented five times the total electrical energy generated in the Irish Free State, or two-and-a-half times the total output which the experts hoped might be utilized by the Shannon Scheme.

There were still, of course, many people who preferred a solid fuel fire; and in these cases the use of a gas burner for ignition would be found to save both labour and nuisance. The demand by new consumers for services and appliances, as well as additional apparatus by existing consumers, showed no signs of abating. As a matter of fact, the new apparatus sent out in 1927 amounted to 10,589 cooking and heating stoves, representing a total value of £40,000. Of this number, 6309 new cookers were supplied on hire to prepayment consumers, and 942 high-grade cookers, 2648 fires, 100 radiators, 260 geysers, wash-coppers, and boilers, and 240 ovens, hotplates, grillers, &c., were sold outright, or on easy terms to customers.

To summarize the financial position, the income was down by £28,366, but, on the other hand, expenditure was reduced by £56,472, so that the profit which they were enabled to carry into net revenue was larger by £28,106. After meeting interest charges, there remained the sum of £52,102, to which must be added the carry-forward from the last account, and a credit from income-tax, making a total of £80,929, which sum would exceed the amount brought into the account after allowing for the payment of the maximum dividend. The reduced price charged for gas during the period under review entitled them to pay an extra 2 p.ct. on the standard dividend, making 7 p.ct. in all; and, in the same way, as the price of gas had been further reduced for the current half-year, they could, if the profit earned justified their doing so, when the accounts for this half-year were made up, pay £2 12s. 6d. p.ct. extra on the standard dividend, making £7 12s. 6d. p.ct.

Mr. J. X. Murphy seconded the motion, which was carried.

PROGRESSIVE POLICY AT BALTIMORE.

The Consolidated Gas, Electric Light, and Power Company of Baltimore have, by the application of scientifically considered rate structures, deliberately designed to reduce the ratio of the Company's investment to dollar of gross income, through more constant use of the generating plant and distribution systems in which the Company's money is invested, and endeavoured to adhere to the policy, of giving more, charging less, and growing faster, which has been consistently pursued since 1910, when the present management undertook the responsibility of its operations.

The Baltimore Company, it may be remarked, was the first gas company in America; and 1927 marked the 111th year of its operations. To-day it has the largest number of gas consumers in its long history; and in the past six years it has sold as much gas as in the twelve years preceding. The benefits secured by the Company as the result of its progressive policy have been shared with the customers and the stockholders, to the advantage of both. It is pointed out by the Company, in its sixth "Year Book," that 1927 was not an unusual year. But while there were no great increases in output, there were decided decreases in the rates charged for service. Economy in operations, where it would not decrease the value of the service, was rigidly enforced; and at the end of the year the Company was in a position to increase the dividend on its common stock.

Customer Shareholders.

Many of the Company's customers share in both the reduced rates and the increased earnings, through having become partners in the enterprise by acquiring the Company's shares. By making shares available for purchase by small monthly payments charged on the regular bills for gas and electric service, the Company has to a considerable degree succeeded in providing, under private management, public ownership of its securities by the people whom it serves. In other words, the army of customers is becoming an army of shareholders.

The Company would like to see this movement continued until each of its customers is a shareholder; and to this end there is provided a Customer-Investment Department, the purpose of which is "to increase the number of Maryland citizens who share in the earnings as well as in the lower cost of the service of their strongest and most useful public servant."

Some Figures.

In 1927, the number of users of gas and electricity on the Company's books were almost equal; the exact figures being: Gas consumers, 188,273; electricity consumers, 188,888. The sales of gas in that year amounted to 11,177,309,500 c.ft., which compares with 10,372,886,400 two years before—that is, in 1925—the increase being 7·76 p.ct. As a matter of fact, the gas output last year showed a slight decrease on 1926 (which was an exceptional year in respect of increase in gas sales), consequent upon temperature conditions which reduced the amount of gas required for heating. There was, however, an increase of 7 p.ct. in the volume of gas sold for industrial purposes, which reflects the efforts being made to build-up the gas industrial load. It is estimated that new business secured for industrial and commercial uses during 1927 will increase the consumption of gas for these purposes by 252,000,000 c.ft. per annum. The manufacturing capacity of the Spring Gardens gas plant was increased by improvements in existing apparatus, which resulted also in economies in operation.

During the year, 52 miles of gas mains were laid, bringing the total mileage up to 1141. There were 6305 new gas services installed—increasing the total number to 175,069.

The maximum gas rate of 85c. net per 1000 c.ft., and lower rates for increased domestic and industrial uses, are encouraging greater gas consumption and the development of gas heating processes in the industries.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of the Metropolitan Gas Company was held in Melbourne on Jan. 27—Sir John Grice (Chairman of Directors) presiding.

The Chairman said that the revenue from sales of gas for the half-year—namely, £711,775—showed an increase of £20,178 against the corresponding period of 1926. The total volume of gas sold for the year 1927 was 4,136,881,000 c.ft., against 4,003,052,000 c.ft. for 1926—an increase of 3·34 p.ct.—but the sales for the half-year under review were only 2 p.ct in advance of the corresponding period of 1926. The profits for the half-year, £105,843, were unsatisfactory, for there had only been available for transfer to reserve fund the small sum of £7000, and to meter renewal fund only £1000, leaving, after payment of the dividend amounting to £97,500, a balance of £343. In addition to the £7000 mentioned, the Directors had transferred £25,000 to the reserve fund from the balance brought forward. This made a total transfer to reserves of £32,000, and left the carry-forward reduced from £86,000 to £61,000.

The cost of manufacture had increased by nearly 9d. per 1000 c.ft. since the last revision in price. It had become imperative, therefore, to increase the price of gas; and after serious consideration it had been decided that the smallest advance which could be made would be 5d. per 1000 c.ft.—namely, from 6s. 8d. to 7s. 1d. This increase commenced from the meter readings on and after Dec. 12 last. The Directors were not sanguine that this would be sufficient, even without any increase in present costs of manufacture, as the return from sales of tar was considerably lower.

The Company's Engineer, Mr. C. F. Broadhead, had just returned from a visit to England, the Continent, and America, and had submitted a report on the practices being followed in gas-works in those countries. The knowledge he had gained by inspecting the latest types of manufacturing machinery would be of great value to the Company.

Excellent results had again attended the activities of the stove and fittings department. During the half-year a general service department had been established. This department, which was in charge of a special officer, handled all applications for turn-on or cut-off, and for attention to appliances, and also received complaints; the object being to ensure that the requirements of the public were dealt with promptly and efficiently.

This year was an eventful one in the Company's history; for it was fifty years since the Metropolitan Gas Company's Act came into operation. The Chairman then proceeded to outline the Company's progress during the fifty years, explaining that the sales of gas had increased 829 p.ct.

Mr. C. B. Evans moved: "That a dividend of 7s. 6d. per share be declared out of the profits for the half-year ended Dec. 31, 1927."

Mr. W. H. Watson seconded the motion, which was agreed to.

The Secretary (Mr. A. E. Bradshaw) replied, on behalf of the staff, to a vote of thanks proposed by Mr. Llewellyn Evans.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDER.

Tendring Hundred Water-Works Company.

To authorize the Company to use scheduled land for gas purposes.

DECLARATIONS OF CALORIFIC VALUE.

Bromsgrove Gas Light and Coke Company.—470 B.Th.U., in substitution for 450 B.Th.U. (June 26.)

Padiham Urban District Council.—500 B.Th.U., in substitution for 475 B.Th.U. (June 22.)

Welwyn and Hatfield Gas Company, Ltd.—500 B.Th.U. (June 30.)

CONTRACTS OPEN.

Coal.

The Nantwich Urban District Council invite tenders for the supply of gas coal. [See advert. on p. 74.]

The Gas Committee of the Borough of East Retford invite tenders for the supply of coal. [See advert. on p. 74.]

Gasholders.

The City of Salford invite tenders for the supply and erection of two 2-lift spiral-guided gasholders. [See advert. on p. 74.]

Wrought-Iron Gates.

The Gas Committee of the Manchester Corporation invite tenders for the supply of wrought-iron entrance gates for their new gas-works at Partington. [See advert. on p. 74.]

MUNICIPAL AND COUNTY ENGINEERS AT THE DAVIS GAS STOVE COMPANY'S WORKS.

The Institution of Municipal and County Engineers held a meeting in the South Midland district at Luton on Friday, March 23, and advantage was taken of this arrangement to invite the members to visit the Davis Gas Stove Company's Works. The invitation was heartily accepted; and early in the afternoon the visitors, numbering over 60, arrived at the works, and were received by the Works Managing Director, Mr. H. Newsom Davis. Several parties were formed, conducted by Mr. Davis and members of his staff, so that, on the tour of the works, full information could be given to all the visitors. It was of necessity a somewhat rapid inspection that was made of so great an undertaking, since the works of the Davis Gas Stove Company and their subsidiary Companies covers about sixteen acres. It was pointed out that, to avoid unnecessary handling of material, the works were arranged in the form of a horseshoe, with inwards and outwards railway sidings. The visitors were able to appreciate the economy of this plan.

First the raw material was seen, near the cupolas which supply the foundry, each capable of melting 70 tons per day. The great extent of the foundry itself, with moulders active in all parts, handling the glowing metal, was most impressive, and it could well be credited that this moulding shop, with a floor area of approximately 3½ acres, is one of the largest engaged in the production of light castings in the country.

The next stage was the dressing or fettling shop, from which the castings proceed for inspection to the passing shop. Visitors were impressed with the care taken in passing only castings of the best quality. The machine shop was next visited, and then the castings warehouse, containing many thousands of parts required for the numerous models which have been issued from these works.

In the fitting shop the finished stoves were seen; and among those which particularly attracted attention, standing ready for the final test before being passed to the despatch warehouse, were the new enamelled cookers, which have recently come so much into public favour. The porcelain enamelling department, recently enlarged for this purpose, was full of interest. The actual enamelling of the various parts was seen, and the operation of the muffles was watched with keen appreciation. An extension of the visit enabled the works of the Nautilus Company to be seen, where the well-known "Nautilus" flue blocks—now being used so extensively in connection with gas fires, for the saving effected in space, labour, and material—are manufactured.

Tea was provided at the Works Institute, and Mr. Edward Willis, M.Inst.C.E. (Engineer of the Brentford and Chiswick Urban District Council), the President of the Institution, voiced the thanks of the members to Mr. H. N. Davis and the Company for the reception given that afternoon. Mr. Willis said that all had been impressed by the happy spirit to be observed in every shop and department. He believed that the good relationship thus manifested, as between Directors and staff, indicated the true manner in which industrial problems of to-day could be solved.

The vote of thanks was heartily received; and in acknowledging, Mr. Davis mentioned that the Luton Works dated from Jan. 1, 1907, representing a concentration of the firm's works previously situated at Falkirk, Camberwell, and Luton.

TRADE NOTES.

Orders for Cast-Iron Pipes.

Among other orders for cast-iron pipes recently received by the Staveley Coal and Iron Company, Ltd., are those from the Oxford Gas Company, for 120 tons of 18 in. and 24 in. diameter pipe, and from the Ipswich Gas Company, for 160 tons of 3 in. to 6 in. diameter pipe.

Steel Barrows and Conveyors.

Messrs. Fredk. Braby & Co., Ltd., of Glasgow, have published a new catalogue describing and illustrating their steel barrows, among which is the "Eclipse" gas-works tilting barrow, made with either solid or ribbed sides. Another new brochure includes a description of the firm's "Eclipse" coal conveyor troughs, which are made from sheets rolled in their own mills.

Ferro-Concrete for Gas-Works.

The Ferro-Concrete Construction Company, Ltd., of Derby, have published a booklet showing ferro-concrete structures which they have carried out during the past few years. Gas-works are often constructed on sites which afford poor foundation conditions; and in such cases ferro-concrete foundations are most economical, either spreading heavy concentrated loads over large areas by rafts, or taking the loads through ferro-concrete piles to more solid strata beneath. Among the many interesting structures illustrated are the purifier houses at Tunbridge Wells and Torquay.

Power-Gas Corporation, Ltd.

The Power-Gas Corporation, Ltd., of Stockton-on-Tees, recently secured an order from Synthetic Ammonia and Nitrates, Ltd., of Billingham, for the fourth extension to the water gas and producer gas plant which they originally installed for this Company. The present order includes nine mechanical water gas generators with waste-heat boiler equipment, auxiliaries, and automatic control, and also four mechanical producer gas generators with auxiliary equipment, together with a building for housing the plant, and an overhead fuel bunker. The installation, with this extension completed, will comprise twenty-one water gas generators and eight producer gas generators, together capable of a total gas output of 4¼ million c.ft. per hour.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The past week has again seen a better tone generally in this market. The demand for prompt coals has been quite good, and has found supplies in many cases restricted, due to the troubles which have been limiting output at many of the collieries. These have now been mostly settled; but colliery turns are, on the whole, well filled for the first half of April, and inquiry remains on a satisfactory scale. The ascertainments governing April wages show slight improvements for both counties; but even on the new much reduced rates they both still show a loss to be borne by the owners.

Northumberland steams are holding to the agreed minimum prices; 13s. 6d. f.o.b. being asked for best screened steams. They are experiencing a certain amount of idle time; but on the whole the position is improving, with fewer weak second-hand holders in the market. In the Durham section, Wear Specials are quoted at 16s. f.o.b., and best qualities 15s. to 15s. 3d. Seconds are about 13s. 3d. to 13s. 6d. There has been a considerably better demand for coking coal, and these are now firmly held at 13s. 6d. to 13s. 9d. Bunkers have also been in much better demand, and best brands are quoting up to 14s. 9d., with ordinaries at a minimum of 13s. 6d. The market for gas coke is weak, and demand is very quiet. Little business is passing, and the quotation is nominally 20s. to 20s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coals are being sought for deliveries to commence well ahead, in some cases as far hence as October. Contracts have been fixed during the past week in the West Riding at advanced figures, as compared with previous contracts. This situation appears likely to prevail for the future.

The industrial market is rather spasmodic, with indications of increased values in washed nuts. The approaching Easter holidays have created the usual demand for coking slacks to cover the period of stoppage; and this fuel has appreciated in value.

The Five Counties Scheme, which comes into operation this week, is creating difficulties in respect of outputs; but these will probably be overcome during the present month. In the meantime, supplies are likely to be limited, especially with the Easter holidays intervening.

The domestic trade has ruled on the quiet side during the past week, with best qualities in little demand. Secondary grades have moved steadily, but with restricted outputs deliveries are not forthcoming quite so promptly as was the case a few weeks ago.

No list of prices was issued in respect of the Humber trade last week; but figures are stated to be normal.

MIDLANDS.

The launching of the Five Counties marketing scheme has been the predominant feature of the market. It has had some effect in firming up prices, but last week there was considerable irregularity as between the different coalfields in the area to which the new organization has been extended. Contracting is well advanced for the time of year as regards the big interests; and with consumption falsifying the predicted expansion, the market has been free from excitement.

With fewer spot lots offering, slacks and smalls have maintained a healthier position. Whatever stringency has developed has been local in its incidence. Good rough slacks have been obtainable at 6s. upwards at the pithead. Industrial requirements have been so poor that few manufacturers have thought it worth while to enter into any large commitments as a safeguard against price appreciation under the operation of the scheme.

Blast-furnace cokes can no longer be bought at 11s. 3d. or 11s. 6d. at the ovens. Those prices, in fact, lasted only a very short time, the quotation going back to about 12s. Some few furnacemen have taken extra cover in the past few days; but the movement has been too insignificant to give a lead to sellers. The fact is that pig iron is being used up at so slow a rate in the forges and foundries that smelters would rather face the contingency of a further curtailment of output than run the risk of over-buying coke.

In existing circumstances the probability of any considerable rise in fuel prices is generally considered remote. In any case, the heavy industries are so short of orders that manufacturers are content to await developments. Some coalowners who are remaining outside the scheme take exception to the principles on which it has been drawn up, and express scepticism as to its continuance for more than a year.

Price of Gas Reduced at Retford.—The Retford Town Council have approved the recommendation of the Gas Committee to reduce the price of gas from 3s. 11½d. per 1000 c.ft. to 3s. 9d. (from 9½d. to 9d. per therm) as from April 1. This makes a decrease of 10d. during the last year.

Devon Gas Association.—The annual meeting of the Devon Gas Association was held at Exeter on March 26. Owing to the absence of the Chairman (Mr. Wm. Cash), Mr. R. J. Rew, the Managing Director, presided. He remarked that 1927 had proved a record year in almost every respect. It had enabled them completely to recover from the disastrous effects of the coal strike, and again to place the undertaking on a thoroughly sound basis. There had been general development involving capital expenditure during the year of £5451, particularly in respect of the Lyme Regis undertaking, from which place the gas mains had now been extended to Uplyme. An increasing demand continued. The consumers now numbered 2914 (202 more than the previous year); and the Association had arranged to fit up during the current year no fewer than 85 subsidy houses.

"Current Sales" and further News Items appear on p. 70.

STOCK MARKET REPORT.

THE promising conditions which prevailed at the closing of the last account continued on the Stock Exchange during the past week, notwithstanding the depressing factors of a long account and the coming holiday. While it is possible that some of the buying was on behalf of "bears" who had assumed that markets would slacken off, there is little doubt that the activity was mainly due to the investing and speculating public, encouraged perhaps by the ever-increasing "How to Invest" articles in the daily Press.

Business was somewhat subdued in the gilt-edged section, but prices were favourably influenced by the easier monetary conditions at the end of the quarter and financial year. Industrials were uneven, and comment still continues on the extravagant height which prices of some of the popular shares have reached.

In the Gas Market the feature of the week was the extraordinary business done in Primitiva ordinary shares. As readers are aware, the Company has paid no dividend since 1914, and the interest displayed, combined with the marking-up of the shares by 2s. 6d. to 23s. 3d.-24s. 3d. indicates that there is a possibility of some distribution for the past year, the accounts for which are expected in a month's time. Estimates have been made on the results of the previous year's accounts from which the conclusion is drawn, that a dividend of from 4 to 6 p.ct. is possible for 1927. There was no other change of importance on the week, and business was quite up to expectations.

The following transactions were recorded during the week:

On Monday, Bombay 22s. 9d., Brighton and Hove 6 p.ct. 116, British 113½, Commercial 98½, European 8⅝, 8½, Gas Light and Coke 18s. 6d., 18s. 6⅝d., 18s. 8¼d., 18s. 9d., 4 p.ct. preference 78, 3 p.ct. debenture 60⅝, Imperial Continental 152½, 154, Primitiva 21s., 21s. 1⅛d., 21s. 3d., 21s. 3⅜d., 21s. 4½d., 21s. 6d., 4 p.ct. debenture (1911) 75, South Metropolitan 104, 104¼, 104½, 104⅝, 105, 105⅛, South Suburban 5 p.ct. 105⅛. Supplementary prices, British 3⅛ p.ct. debenture 62½, Derby 5 p.ct. 110½, 111, Folkestone 75¼.

On Tuesday, Aldershot "C" 75, 4 p.ct. preference 70½, Alliance and Dublin 97⅛, 98½, Bournemouth 6 p.ct. preference 11, Brighton and Hove 6 p.ct. 117, British 114½, Commercial 98⅝, European 8½, Gas Light and Coke 18s. 6d., 18s. 9d., 3 p.ct. debenture 61¼, Imperial Continental 152½, 153⅜, Newcastle 3⅛ p.ct. debenture 66½, Primitiva 21s. 1½d., 21s. 4½d., 21s. 6d., 21s. 7½d., 21s. 9d., South Metropolitan 105, 6 p.ct. preference 110½, 6½ p.ct. debenture 100, South Suburban 105⅛, Tottenham "B" 94, Wandsworth 3 p.ct. debenture 58, 4 p.ct. debenture 77. Supplementary prices, Brighton and Hove 4 p.ct. debenture 76½, Derby 5 p.ct. 110, 111, Redhill 5⅛ p.ct. preference "A" 100.

On Wednesday, Alliance and Dublin 98, Bombay 22s. 6d., 22s. 9d., Bournemouth 7 p.ct. 12½, 6 p.ct. preference 11½, British 112½, 114, 114½, Commercial 99½, Gas Light and Coke 18s. 6d., 18s. 7½d., 18s. 8d., 18s. 9d., 3⅛ p.ct. 63½, 4 p.ct. preference 79, Imperial Continental 153, 154, 3⅛ p.ct. debenture 69, 69½, Primitiva 21s. 4½d., 21s. 7½d., 21s. 10½d., 22s., 22s. 1½d., 22s. 3d., 22s. 4½d., 22s. 6d., 22s. 7½d., 22s. 9d., 23s., South Metropolitan 104½, 105½, 6 p.ct. preference 110½, Uxbridge 5 p.ct. 89, 89½, 90, Wandsworth 4 p.ct. debenture 76. Supplementary prices, Canterbury consolidated "B" 149½, 150, Folkestone 74½, 75½, Wandsworth 5 p.ct. debenture 99½.

On Thursday, British 115, Continental Union 30, Croydon sliding-scale 107½, Gas Light and Coke 18s. 6d., 18s. 7½d., 18s. 9d., 3⅛ p.ct. maximum 64½, 4 p.ct. preference 77⅜, 79, 3 p.ct. debenture 60⅛, Hornsey 3⅛ p.ct. 79⅜, 80, Primitiva 23s., 23s. 1½d., 23s. 3d., 23s. 4½d., 23s. 6d., 23s. 7½d., 23s. 9d., 23s. 10½d., 24s., 24s. 1½d., 4 p.ct. debenture 76, South Metropolitan 104½, 105, 105½, South Suburban 107, Tottenham 3½ p.ct. 94. Supplementary prices, Wandsworth 5 p.ct. debenture 99½.

On Friday, Alliance and Dublin 98⅛, 98⅜, 98½, 4 p.ct. debenture 66, Bombay 23, Commercial 99, Gas Light and Coke 18s. 6d., 18s. 7½d., 18s. 9d., 3 p.ct. debenture 60⅝, Primitiva 23s. 3d., 23s. 4½d., 23s. 6d., 23s. 7½d., 23s. 9d., 24s., 24s. 1½d., 24s. 3d., South Metropolitan 105⅛, 6½ p.ct. debenture 101, Swansea 6½ p.ct. debenture 101½, 102, Uxbridge 5 p.ct. 89, 90. Supplementary prices, Bognor consolidated 90½, 100, Rochester, Chatham 88½, Uxbridge 4 p.ct. debenture 74½, Walkefield 5 p.ct. 81½.

Lombard Street was amply supplied with money at the close of the week. The rate for overnight accommodation was 3½ p.ct. whether for new or old loans. Treasury Bills were allotted at £4 0s. 5·07d. p.ct., being over 1s. 7d. p.ct. above the previous week's rate, and discount rates, which early in the day were inclined to weaken, stiffened immediately.

On the Foreign Exchange Market, the spot rate for dollars closed at 4.88$\frac{7}{32}$, a decline of $\frac{2}{32}$c.; Dutch florins were again dearer at 12.11$\frac{15}{16}$; Belgas advanced to 34.07; German marks cheapened to 20.41½; Spanish pesetas were dearer at 28.09; and Italian lire and French francs remained unchanged.

Silver declined $\frac{1}{16}$d. to 26$\frac{3}{16}$d. per oz.; but Gold was ¾d. higher at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Shares.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 30.	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 9	5	5	Aldershot 5 p.c. max. C.	70—75	..	75
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	70½
1,451,868	,,	Sept. 29	7	7	Alliance & Dublin Ord.	95—99	..	97⅞—98½
874,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64—67	..	66
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c.	100—112	..	..
800,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	22/—24/-	..	22/6—23/-
170,000	10	Mar. 8	8½	8½	Bournemouth 5 p.c.	12¼—12½	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	12½
875,000	10	,,	6	6	Do. Pref. 6 p.c.	10¼—11	..	11—11⅛
50,000	Stk.	Jan. 12	3	3	Do. 8 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
857,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	116—117
341,880	,,	,,	6/8/6⅔	6⅔	Do. 5 p.c. Con.	103—106	..	..
1,827,500	,,	Feb. 23	5	5	Bristol 5 p.c. max.	87—88a	—1	..
855,000	,,	Mar. 22	8	7	British Ord.	112—115*	..	112½—115
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114—117	..	..
150,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Nov. 24	8	6	Cape Town, Ltd.	8—9	..	..
100,000	10	Oct. 27	4½	4½	Do. 4½ p.c. Pref.	6¾—7¼	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72—77	..	..
685,860	,,	Feb. 23	6	6	Cardiff Con. Ord.	98—101	..	..
357,860	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Feb. 23	5	6½	Chester 5 p.c. Ord.	86—91b	..	..
79,185	1	Oct. 13	12/-	12/-	Colombo Ltd. Ord.	31/—33/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
375,402	1	Oct. 13	1/92	1/9½	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	..
187,948	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
2,073,280	Stk.	Feb. 23	5	7	Commercial Ord.	97—100	..	..
475,000	,,	Dec. 22	8	8	Do 8 p.c. Deb.	57—60	..	98¼—99½
600,000	,,	Sept. 29	11	11	Continental Union, Ltd.	28—33	..	30
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	88—93	..	..
787,580	,,	Mar. 8	6½	7	Croydon sliding scale	105—108	..	107½
400,100	,,	,,	5	5	Do. max. div.	81—84	..	..
492,370	,,	Mar. 8	7	10	Derby Con.	110—115s	..	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—73s	..	..
809,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c.	76—79	..	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Mar. 22	†4	†6	European, Ltd.	8—9*	..	..
13,705,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/6—19/-f	..	8½—8⅝
1,500,000	,,	,,	3⅛	3⅛	Do. 8¼ p.c. max.	63—65	+1	18/6—18/9
4,187,030	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	63⅛—64½
6,692,620	,,	Dec. 22	8	8	Do. 3 p.c. Con. Deb.	60—62	..	77⅞—79
181,815	,,	,,	6	6	Do. 6 p.c. Br'st'd Rd. Db.	102—105	..	60⅞—61½
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—101	..	..
48,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
68,500	,,	Mar. 8	6½	6½	Hastings & St L. 5 p.c. Conv	87—90	..	..
358,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	68—71	..	..
70,000	10	Oct. 13	†10	†10	Hongkong & China, Ltd.	13¾—14½	..	..
173,200	Stk.	Mar. 8	5	5	Hornsey Con. 3½ p.c.	78—81	..	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	151—155	+1½	79½—80
233,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	152½—154
235,242	,,	Mar. 8	7	7	Lea Bridge 5 p.c. Ord.	94—97	..	69—69½
3,145,907	,,	Feb. 23	5½	5½	Liverpool 5 p.c. Ord.	87½—88½b	..	..
600,000	,,	Mar. 22	7	7	Do. 7 p.c. Red. Pref.	101½—103½b	..	..
165,736	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap.	108—111	..	..
75,000	5	Dec. 22	†7	†8	Malta & Mediterranean	5½—6	..	..
541,920	Stk.	Nov. 24	†7	†5	Montevideo, Ltd.	92—94	..	..
2,021,315	,,	Mar. 8	5	5	Newcastle & Gateshead Con.	16/8—16/9d	..	..
260,928	,,	,,	4	4	Do. 4 p.c. Pref.	66½—67½d	..	..
691,705	,,	June 29	3½	3½	Do. 3½ p.c. Deb.	66½—67½d	..	..
131,780	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 6 p.c. Con.	97—100	..	..
300,000	,,	Nov. 24	7	9	Oriental, Ltd.	116—121	..	..
188,130	,,	Dec. 22	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,600	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101—104	..	..
236,732	,,	,,	5	5	Do. 5 p.c. max.	77—80	..	..
2,334,464	1	—	—	—	Primitiva Ord.	23/3—24/3	+2/6	21/—24/3
247,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	92—95	..	..
695,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	74—76	..	75—76
439,188	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	74—76	..	..
160,000	10	Mar. 22	6	6	San Paulo 6 p.c. Pref.	8—8½*	..	..
125,000	50	Jan. 3	5	5	Do. 5 p.c. Red. Deb.	46—48	..	..
270,000	Stk.	Mar. 22	6	6	Sheffield A	100—102e†	—2	..
415,968	,,	,,	6	6	Do. B	100—102e†	—2	..
1,047,000	,,	,,	6	6	Do. C	100—102e†	—2	..
90,000	10	May 26	4	6	South African	4—6	..	..
6,809,995	Stk.	Feb. 23	5	7½	South Met. Ord.	104—106	..	104—105⅝
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	109—112	+1	110½
1,896,446	,,	Jan. 12	3	3	Do. 5 p.c. Deb.	59—62	..	..
784,000	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	100—101
91,500	,,	Feb. 23	8½	8½	South Shields Con.	110—112d	..	..
1,343,795	,,	Feb. 23	6⅔	6⅔	South Suburban Ord. 5 p.c.	104—107	..	105½—107
868,837	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Mar. 22	5	5	South'mpton Ord. 5 p.c. max.	77—79*	..	..
191,275	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	72—75	..	..
950,000	,,	Mar. 8	7	7	Swansea 7 p.c. Red. Pref.	100—103	..	..
200,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	101½—102
130,000	,,	Feb. 23	7⅜	7⅜	Tottenham District A 5 p.c.	110—115	..	..
882,376	,,	,,	6½	6½	Do. B 5½ p.c.	92—95	..	94
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95—98	..	..
191,255	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	74—77	..	..
368,251	,,	Mar. 8	5	5	Tynemouth Con. and New	78—80d	..	..
239,094	,,	Mar. 8	6½	6⅔	Uxbridge, Maidenhead, & Wycombe 5 p.c.	87—90	..	89—90
68,320	,,	,,	5	5	Do. 5 p.c. pref.	88—88	..	..
80,000	,,	Mar. 8	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	129—134	..	..
255,686	,,	,,	7	7	Do. B 5½ p.c.	111—116	..	..
432,595	,,	,,	5/19/0	5/19/0	Do. C and New	98—103	..	..
353,000	,,	,,	6⅔	6⅔	Do. Wimbledon 5 p.c.	106—111	..	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	112—117	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	86—91	..	..
88,416	,,	Dec. 22	3	3	Do. 3 p.c. Deb.	57—60	..	58
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	76—77

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.